THE Gentleman's Diary, OR THE MATHEMATICAL REPOSITORY:

An ALMANACK

For the YEAR of our LORD 1744.

Being the BISSEXTILE, or LEAP-YEAR.

Containing many useful and entertaining Particulars, peculiarly adapted to the ingenious Gentlemen engaged in the Study and Practice of the

MATHEMATICKS.

The Fourth *Almanack* ever publish'd of this Kind.

——— Quâ causâ argentea Phœbe
Passibus haud æquis graditur; cur subdita nulli
Hactenus Astronomo numerorum fræna recusat:
Cur remeant Nodi, curque Auges progrediuntur.
——— Quantis refluum vaga Cynthia pontum
Viribus impellit; dum fractis fluctibus ulvam
Deserit, ac Nautis suspectas nudat arenas,
Alternis vicibus suprema ad littora pulsans.

LONDON:
Printed for the Company of STATIONERS.
MDCCXLIV.

An Historical Account of the Rise, Progress &c. of ALGEBRA.

IN our last we gave our Readers a short Account of the Invention and Progress of common *Arithmetic*; and shall now proceed to give the History of the *Analytic Art*; in order to which we have for some time had mss. notes by us; but upon the Appearance of Mr. NATHANAEL HAMMOND's *Algebra*, we find in his Introduction, the History of its Rise and Progress, more to our Satisfaction, and therefore hope that ingenious Author will excuse us making use of some of his Words in the following Account.

"The Word *Algebra* is certainly derived from the *Arabic*, "but there have been some Mistakes as to its meaning. "When it was first introduced in *Europe*, it was understood "to be the Invention of the famous Philosopher *Geber*; and "therefore *Michael Stifelius* (the first Writer on the Subject "in this Part of the World after *Lucas Pacciolus*) calls it "sometimes *Regula Algebra*, and sometimes *Regula Gebri*, "whence it is plain he understood by it no more than the "Rule of *Geber*, or, as we usually express it, *Geber*'s Rule. "But, when we became better acquainted with *Arabic* Learning, this Derivation appeared ill-founded: In that Language, this Art is called *Al-gjábr Wâl-mokábala*, which is "literally, the Art of Resolution and Equation. Hence it is "plain, we had the Word *Algebra* from the *Arabic* Name "of the Art, and not from the pretended Inventor. But "it may not be amiss to observe, that the *Arabic* Name "contains a Definition, or is rather an emphatic Declaration "of the Nature and End of this Science; for the *Arabic* "Verb *jábaca* signifies to reset, and is properly used in respect to Dislocations, and the Verb *hábala*, implies opposing, or comparing; and how applicable this is to what "we call *Algebra*, our Readers who are acquainted with "the Science can easily understand. As it became better "known to the *Europeans*, it receiv'd different Names; the "*Italians* styled it *Ars Magna*, in their own language *l'Arte Majore*, opposing it to common Arithmetic, as the lesser or "minor Art. It was also called *Regula Cosa*, the Rule of "*Cos's*, for an odd Reason: The *Italians* make use of the "Word *Cosa*, to signify what we call the Root, and from "thence, this kind of Learning being derived to us from "them, the Root, the Square, and the Cube, were called "*Cossic* Numbers, and this Science the Rule of Cos's.

" As to the Origin of this Art we are much in the Dark, " and it is a Point still disputed, whether the Invention of " Algebra ought to be ascribed to the *Oriental* Philosophers, " or to the *Greeks*; but it is a thing certain, that we re- " ceiv'd it from the *Moors*, who had it from the *Arabians*, " who own themselves indebted for it to the *Persians* and " *Indians*; and yet (which is strange enough) the *Persians* " refer the Invention to the *Greeks*, and particularly to *Ari-* " *stotle*. Yet, notwithstanding this, it must be allow'd that " the *Algebra* taught us by the *Arabians* differs very much " from that contained in the Works of *Diophantus*, the eld- " est *Greek* Author on this Art, which is now extant (and " to whom the Invention is usually attributed) tho' it was " discovered and published long after the *Algebra* taught by " the *Arabians* had been studied and improved in the West. " But all these Difficulties, which have given some great " Men so much Trouble, may be easily surmounted, if we " suppose that the Invention was originally taken from the " *Greeks*, and new modelled by the *Arabians*, in the same " manner as we know that Common Arithmetic was; for " this, which is at least extremely probable, makes the " whole plain and clear, and leaves us at liberty to pursue " the Progress of this Art from the first printed Treatises " about it.

Lucas Pacciolus a Franciscan Friar, commonly known by the name of *Lucas de Burgo Sancti Sepulchri*, a Cordilier, published at *Venice* a Book in Italian, under the title of *A Complete Treatise of Arithmetic and Geometry, Proportions and Equations*, the first Book at present extant on this Subject. It was printed so early as 1494. and is a very correct Treatise: He makes mention of one *Leonardus Pisanus*, and some others of whom he learned the Art, but we have none of their Writings; he ascribes the Invention of Algebra to the *Arabians*, uses their Method, and treats very clearly of Quadratic Equations, but goes no further; nor makes any mention of *Diophantus*; which makes it very probable, that that Author was not yet known in *Europe*.

After him, several Authors wrote on the same Subject in *Italy* and in *Germany*; but still the Art advanced little till the famous *Jerom Cardan*, printed at *Nuremberg* in 1545. in Folio, a Treatise with this Title, *Artis magnæ, sive de Regulis Algebraicis Liber unus*; and soon after a smaller Piece, with

the Title of *Sermo de plus & minus*, wherein were contained Rules for resolving Cubic Equations, which have since been called *Cardan*'s Rules, tho' they were not invented by him, but, as himself owns, by *Scipio Ferreus* of *Bononia* and *Tartaglia*.

The next celebrated Writer was a *French* Monk, whose Name was *Boteon*, better known to the Learned by his *Latin* Appellation of *Buteo*; he published in 1559. his *Logistica*, in which there was a Treatise of *Algebra* which gained him great Reputation: Yet his Excellency lay in a clear and copious Manner of Writing, nor does it appear that he added any thing to what had already been discovered, except some Corrections in *Tartaglia*'s Method of managing Cubic Equations.

Hitherto nothing was known in *Europe* of the *Greek* Analysis, but in 1575 *Xilander* published *Diophantus*, or at least a Part of his Works, for he wrote thirteen Books, tho' only six of them are extant; and this quickly chang'd the Face of Things, for it presently appeared that his was a neater and more easy Method, and withal opened a Path to much greater Discoveries, which was the Reason that succeeding Algebraists quitted the Terms made use of by Arabic Writers, and followed his. The Time in which *Diophantus* flourish'd is not thoroughly settled. *Vossius* thinks he lived in the second Century, but others place him in the fourth. His Works were known to the *Arabians*, and translated by them; nay, it is said that they have still those seven Books of his Arithmetic which are lost to us.

(To be continued in our next.)

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ALL Persons who are pleased to be CONTRIBUTORS, by answering the ÆNIGMA'S, QUESTIONS, &c. in this DIARY; or by sending new Ænigma's, Questions, Paradoxes, or other Subjects fitting for this WORK, are desired to send them, and their Solutions along with them, before the first Day of *May* 1744, directed for the Authors of the Gentleman's Diary, to be left with Mr. *JOHN FULLER* at the *Bible* and *Dove* in *Creed-Lane*, near St. *Paul*'s, *London*: Or (if more convenient for Postage, &c.) to be left with Mr. *Thomas Peat*, Writing-Master, and Teacher of the Mathematicks in *Nottingham* (Post paid, or they will not be receiv'd.)

JANUARY hath xxxi Days.				M D	Day Breaks.	Twil. Ends.
New Moon 3 Day at 1 q. past 8 at Night				6	5 h 51	6 h 9
First Quarter 11 Day 28 M. past 7 Night				12	5 44	6 16
Full Moon 18 Day at 38 M. before Noon				18	5 36	6 24
Last Quart. 25 Day 10 M. past 10 Morn				24	5 27	6 33
				31	5 16	6 44
1	A	Circum. 1 Sund. aft. Christmas		thig.	6 M 59	10 M 8
2	M	*The Year is likely to begin with*		kne.	7 49	10 A 56
3	T	*Cold Rain or Sleets of Snow*		ham.	☽ Sets	11 50
4	W	Days increas'd and		legs	4 A 16	0 A 38
5	T	Nights shortened 33 min.		ank.	5 28	1 24
6	F	Epiph. **Notting. Epip. Fair**		ank.	6 42	2 8
7	S	is always the 1st Fr. aft. Jan. 2.		feet	7 57	2 50
8	A	1 Sunday after Epiphany		toes	9 12	3 32
9	M	Day 8 hours 6 min. long		head	10 26	4 11
10	T	*Rough blustering Winds, and*		and	11 44	4 57
11	W	*perhaps some Downfal*		face	Morn.	5 37
12	T	Day 8 hours 14 min. long		neck	1 2	6 26
13	F	Hillary. **Marriage comes in**		thro.	2 27	7 17
14	S	Ox. Hil. and Cam. Lent. T. beg.		arms	3 56	8 17
15	A	2 Sunday after Epiphany		shou.	5 23	9 19
16	M	*Still expect turbulent*		brea.	6 41	10 28
17	T	*winterly Weather,*		stom	7 40	11 36
18	W	Day 8 hours 34 min. long		hear.	☽ Rise	Morn.
19	T	*'till towards the end*		back	5 A 36	0 36
20	F	P. of WALES b. Oct. Hill.		bow	7 14	1 33
21	S	**Agnes. Marriage goes out**		belly	8 42	2 23
22	A	Septuagesima Sunday.		reins	10 10	3 12
23	M	Hillary Term begins		oyn	11 30	3 55
24	T	*More fair and frosty*		secr.	Morn.	4 45
25	W	Conversion of St. PAUL		blad.	0 49	5 32
26	T	Day 9 hours 8 min. long		hips	2 7	6 17
27	F	Quind. Hil. 2 Return		hig.	3 20	7 5
28	S	*Cold slabby Weather to the end*		ind	4 34	7 53
29	A	Sexagesima Sunday		kne.	5 38	8 46
30	M	K. CHARLES I. mart. 1648. at		ham.	6 26	9 37
31	T	*White Hall* 12 min. past 1 aft.		ind	7 0	10 26

M D	Sun Rises.	Sun Sets.	Saturn South.	Jupiter Rises.	Mars Sets.	Venus Rises.	Mercu. Sets.	Watch too fast.
6	8 1	3 59	3 M 25	11 N 17	5 N 11	4 M 26	4 N 40	10 35
12	7 53	4 7	3 0	10 54	5 14	4 35	5 9	12 21
18	7 43	4 17	2 33	10 29	5 17	4 43	5 52	13 40
24	7 32	4 28	2 8	10 3	5 21	4 52	6 17	14 29
31	7 19	4 41	1 40	9 36	5 23	5 0	6 14	14 43

FEBRUARY hath xxix Days.

M D	Day Breaks.	Twil. Ends.
6	5 3	6 57
12	4 53	7 7
18	4 41	7 19
24	4 28	7 32
29	4 18	7 42

New Moon 2 Day 1 q. before 3 Aftern.
Firſt Quarter 10 Day 54 M. paſt 6 Morn.
Full Moon 16 Day 49 M. paſt 9 Night.
Laſt Quarter 24 Day 39 M. paſt 4 Morn.

M D	D W	Sund. & Holy D. rem. D. Ter. / length & incr. of Days, Wea.	Moons Signs	Moon R. and S.	Moon South.
1	W	*Still wet and windy*	legs	7 M 27	11 M 14
2	T	Purification, or Candlemaſs D.	ankl.	☽ Sets	0 A 1
3	F	Craſt. Purif. 3 Return	feet	5 A 42	0 45
4	S	*Perhaps ſnow or ſleets*	and	7 0	1 26
5	A	Quinquageſima, Shrove Sund.	toes	8 13	2 9
6	M	Day 9 hours 47 min. long	head	9 30	2 50
7	T	*More fair and inclin'd to Froſt*	face	10 47	3 33
8	W	Aſh Wedneſday, 1ſt Day of Lent	neck	Morn.	4 19
9	T	☉ Riſing Amp. 18° 28′ South	thro.	0 12	5 8
10	F	*More enclin'd to Downfall*	arms	1 40	6 6
11	S	Days increas'd 2 hours 54 min.	ſho.	3 8	7 5
12	A	Quadrageſima, 1ſt Sund. in Lent	brea.	4 28	8 10
13	M	Term ends	Sto.	5 29	9 14
14	T	Valentine	hear.	6 13	10 17
15	W	Ember Week	back	6 40	11 16
16	T	*Rough bluſtering Winds*	bow	☽ Riſe	Morn.
17	F	*and perhaps Sleet or Snow*	belly	6 A 12	0 10
18	S	Day 10 hours 38 min. and	reins	7 38	1 0
19	A	2 Sunday in Lent. Reminiſcere	loin	9 4	1 49
20	M	Night 13 hours 22 min. long	ſecr.	10 27	2 36
21	T	*Still winterly Weather*	blad.	11 50	3 21
22	W	Princeſs of Hesse born	hips	Morn.	4 11
23	T	Days are now increas'd and	thig.	1 8	5 1
24	F	St. Matthias the Apoſtle	knee	2 20	5 52
25	S	Nights ſhorten'd 3 h. 45 min.	and	3 31	6 41
26	G	3 Sund. in Lent. Oculi	ham.	4 28	7 32
27	M	*More fair and pleaſant*	legs	5 7	8 24
28	T	*towards the end*	and	5 33	9 14
29	W	Day 11 hours 23 min. long	ankl.	5 55	10 1

M D	Sun Riſes.	Sun Sets.	Saturn South.	Jupiter Riſes	Mars Sets	Venus Riſes	Mercu. Sets.	Watch too faſt.
6	7 7	4 53	1 M 15	9 N 9	5 N 28	5 M 4	5 N 31	14′ 35″
12	6 55	5 6	0 50	8 45	5 35	5 6	Riſes	13 55
18	6 42	5 19	0 26	8 19	5 40	5 7	6 M 46	12 53
24	6 30	5 31	0 2	7 53	5 46	5 6	6 33	11 32
29	6 19	5 42	11 N 37	7 30	5 49	5 5	6 24	10 14

MARCH hath xxxi Days.

M D	Day Breaks.	Twil. Ends.
6	4 3	7 57
12	3 50	8 10
18	3 35	8 25
24	3 17	8 43
31	3 7	8 53

New Moon 3 Day 3 q. past 7 Morning
First Quart. 10 Day 1 q. past 3 Afternoon
Full Moon 17 Day 50 M. past 8 Morning
Last Quart. 24 Day at Midnight

1	T	St. David	feet	6 M 10	10 M 48
2	F	Chad B.	and	6 21	11 26
3	S	☉ Amplit. at Rising 3° 38′ S	toes	☽ Sets	0 A 10
4	G	2 Sund. in Lent, Midlent Sun.	head	7 A 23	0 53
5	M	*Frosty, with cold drying Winds*	face	8 42	1 42
6	T	Days now incr. 4 hours and half	neck	10 8	2 25
7	W	Cambridge later Act	thro.	11 32	3 11
8	T	Equal Day and Night in all the	arms	Morn.	4 4
9	F	☉ in ♈ 1 q. past 6 Morn.	sho.	1 0	5 3
10	S	habitable Parts of the Earth.	brea.	2 20	6 3
11	G	3 Sunday in Lent. Judica	and	3 31	7 6
12	M	Days 12 hours 1 quarter long.	stom	4 20	8 11
13	T	*Right March Weather*	heart	4 48	9 10
14	W	Prince EDWARD born	back	5 16	10 6
15	T	☉ Due 6h 7 m Alt. then 2° 57′	bow	5 30	10 57
16	F	Oxford and Cambridge T. end	belly	5 51	11 44
17	S	Days now incr. 5 hours 21 min.	reins	☽ Rise	Morn.
18	G	4 Sund. in Lent, Palm Sunday	loin.	8 A 8	0 32
19	M	*Windy and stormy, and*	secr.	9 31	1 19
20	T	☉ Amplitude 7° 09′ North	blad	10 54	2 8
21	W	☉ Due E. 6 h. 14 M. Alt. 5° 52.	hips	Morn.	3 0
22	T	Maunday Thursday	thig	0 16	3 52
23	F	Good Friday, CHRIST Crucif.	ind	1 30	4 44
24	S	*Probably some Claps of Thunder*	kne.	2 27	5 35
25	G	EASTER DAY, Annun V. M.	ham	3 12	6 24
26	M	Easter Monday	legs	3 45	7 16
27	T	Easter Tuesday	and	4 8	8 3
28	W	Day 13 hours 20 min. long	ankl.	4 24	8 50
29	T	*Now more moderate, and perhaps*	feet	4 39	9 33
30	F	*some gentle showers at the end*	toes	4 50	10 16
31	S	D. incr. and N. short. 6 h. 1 q.	head	4 57	10 50

M D	Sun Rises.	Sun Sets.	Saturn South.	Jupiter Rises.	Mars Rises.	Venus Rises.	Mercu. Rises.	Watch too fast.
6	6 6	5 55	11 N 16	7 N 4	6 M 13	5 M 0	5 M 28	8′ 31″
12	5 53	6 8	10 52	6 39	5 59	4 54	5 24	6 47
18	5 41	6 20	10 29	Sets	5 42	4 49	5 18	4 48
24	5 29	6 32	10 5	5 M 30	5 27	4 40	5 11	2 58
31	5 15	6 46	9 40	5 4 5	5 11	4 31	5 2	0 57

APRIL hath xxx Days.

M. D	Day Break.	Twil. Ends.
6	2 38	9 22
12	2 16	9 44
18	1 55	10 5
24	1 29	10 31
30	0 48	11 12

New Moon 1 Day 6 min. past 10 Night
First Quarter 8 Day 20 min. past 9 Night
Full Moon 15 Day 3 quart. past 8 Night
Last Quarter 23 Day 37 min past 6 Night

1	G	1 Sund. aft. East. ☉ Ecl. invis.	face	☽ Sets.	11 M	42
2	M	**Marriage comes in**	neck	7 A	52	0 A	27
3	T	*Blustering Winds, but*	and	9	19	1	17
4	W	**Dr. and Cam. Ter. beg.**	thro.	10	56	2	10
5	T	*not much downfal*	arms	Morn.		3	7
6	F	Day 13 hours 58 min and	sho.	0	21	4	9
7	S	Night 10 hours 2 min long	brea.	1	34	5	14
8	G	2 Sund. aft. East. Misericord.	stom	2	26	6	14
9	M	Quind. Pasch. 1 Return	heart	3	4	7	12
10	T	☉ Ampl. at Rising 20° 10′ N.	back	3	29	8	8
11	W	Easter Term begins	bow	3	44	8	58
12	T	Days increas'd 7 ho. 4 min.	belly	3	56	9	46
13	F	*Fair, pleasant Weather*	reins	4	6	10	37
14	S	☉ Due E. 6 h 41 m Alt 16° 42′	loins	4	16	11	20
15	G	3 S. aft. E. Pr. WILLIAM bo.	secr.	☽ Rise		Morn.	
16	M	☽ Eclips'd visible. Tr. P. 2 Ret.	and	8 A	35	0	6
17	T	Day 14 hours 43 min. long	blad.	9	6	0	54
18	W	*Now expect some gentle*	hips	11	12	1	46
19	T	*Showers, and perhaps Fogs*	thig.	Morn.		2	36
20	F	*and misty Mornings*	knee	0	23	3	32
21	S	☉ Rising Amp. 26° 19′ North	and	1	18	4	22
22	G	4 Sund. aft. Easter. Cantate	ham	1	51	5	14
23	M	St. George. Mens. Pasch 3 Ret.	legs	2	18	6	2
24	T	**Westminster Election**	ankl.	2	37	6	48
25	W	St. MARK the Evangelist	feet	2	50	7	32
26	T	*Still no great Alteration*	toes	3	0	8	13
27	F	☉ Due E 6h 54. Alt then 22°19′	head	3	11	8	48
28	S	**Marriage goes out**	and	3	19	9	39
29	G	5 Sund. aft. East. Jucunditatis	face	3	28	10	24
30	M	Quin. P. 4 Ret. D. inc. 8 h. 9 m.	neck	3	42	11	10

M. D	Sun Rises.	Sun Sets.	Saturn Sets.	Jupiter Sets.	Mars Rises.	Venus Rises.	Mercu. Rises.	Watch too slow
6	5 2	6 59	4 M 3	4 M 38	4 M 52	4 M 17	3 M 52	0′ 35″
12	4 51	7 10	3 39	4 14	4 37	4 5	4 42	1 54
18	4 39	7 22	3 16	3 15	4 22	3 54	Sets.	2 55
24	4 28	7 33	2 53	3 27	4 8	3 45	8 N 20	3 37
30	4 18	7 43	2 30	3 3	3 52	3 34	9 18	4 0

MAY hath xxxi Days.

	M D
New Moon 1 Day 19 min. past 9 Morning	6
First Quarter 8 Day 38 min. past 2 Morning	12
Full Moon 15 Day 25 min. past 9 Morning	18
Last Quarter 23 Day 39 min. past 11 Morning	24
New Moon 30 Day 55 min. past 5 Afternoon	31

No real Night, but all Twilight

1	T	St PHILIP and JACOB Ap.	thro.	☽	Sets	0	A	4
2	W	Rogation Week	arms	10	N	4	0	57
3	T	Holy Thurſ. Chriſt's Aſcenſion	ſho.	11		52	2	2
4	F	*Cold harſh Winds*	brea.	Morn.			3	6
5	S	*inclining to drought*	ſtom	0		28	4	10
6	G	6 Sund. after Eaſter. Exaudi	heart	1		13	5	10
7	M	Eaſter Term ends	back	1		38	6	6
8	T	☉ Riſ. Ampl. 34° 20′ North	bow	1		56	6	58
9	W	☉ Due E. 7 Morn Alt. 25° 28′	belly	2		10	7	46
10	T	**Oxf.** and **Cam.** Term ends,	reins	2		20	8	32
11	F	*Now more warm*	and	2		30	9	16
12	S	*with flying Showers*	loyn.	2		40	10	2
13	G	WHIT-SUNDAY	ſecr.	2		52	10	50
14	M	Monday	blad.	3		27	11	38
15	T	Tueſday	hips	☽	Riſe	Morn.		
16	W	Ember Week	thig.	10	N	8	0	30
17	T	*Wind and Rain*	knc.	11		5	1	20
18	F	Day 16 hours 1 quart. long	and	11		50	2	14
19	S	**Marriage comes in**	ham	Morn.			3	4
20	G	Trinity Sunday	legs	0		22	3	55
21	M	Craſt. Trin. 1 Return	ankl.	0		41	4	41
22	T	**Trin coll.** Election	feet	0		58	5	26
23	W	**Oxford** Term begins	and	1		8	6	4
24	T	Prince GEORGE born	toes	1		18	6	48
25	F	Trinity Term begins	head	1		26	7	27
26	S	☉ Riſing Ampl. 39° 54′ No.	face	1		34	8	12
27	G	1 Sund. aft. Trinity	neck	1		46	8	58
28	M	Oct. Trin. 2 Ret.	thro.	1		57	9	48
29	T	K. CHA. II. Birth and Ret.	arms	2		16	10	41
30	W	P. AMEL. & CAR. born.	ſho.	☽	Sets		11	42
31	T	*Showery towards the End*	brea.	10	N	4	0	A 46

M D	Sun Riſes.		Sun Sets.		Saturn Sets.		Jupiter Sets.		Mars Riſes.		Venus Riſes.		Mercu. Sets.		Watch too ſlow	
6	4	8	7	53	2 M	8	2 M	40	3 M	40	3 M	26	9 N	53	4′	1″
12	4	0	8	1	1	45	2	16	3	25	3	15	10	12	3	43
18	3	52	8	8	1	22	1	50	3	10	3	8	10	18	3	5
24	3	47	8	14	0	56	1	26	2	54	2	56	9	58	2	12
31	3	41	8	2	0	29	0	58	2	40	2	46	9	24	0	54

JUNE hath xxx Days.

MD	
6	No Real Night, but
12	
18	
24	
30	

First Quarter 6 Day 23 min. past 8 Morn.
Full Moon 13 Day at 11 at Night
Last Quarter 22 Day 22 min. past 2 Morn.
New Moon 29 Day at 1 Morning.

								All Twi-light.
1	F	Day 16 hours 40 min. long	ſtom	11	N 4	1	A 52	
2	S	*Hot and ſhow'ry and perhaps*	heart	11	37	2	56	
3	G	2 Sunday after Trinity	back	11	54	3	56	
4	M	Quind. Trin. 3 Ret.	bow	Morn.		4	51	
5	T	*ſome Claps of Thunder*	and	0	13	5	40	
6	W	The greateſt Lengthening of	belly	0	24	6	26	
7	T	Days at *Lond.* 8 h. 50 min.	reins	0	34	7	21	
8	F	*Now more windy*	loin.	0	43	7	56	
9	S	☉ ♎ 10 Day at 4 Morn.	ſecr.	0	54	8	43	
10	G	3 Sund. aft. Trin. Tres. T. 4 R.	blad.	1	8	9	31	
11	M	K. GEO. II. Inaug. St. BAR.	hips	1	27	10	18	
12	T	*but inclined to Rain*	and	1	46	11	9	
13	W	Trinity Term ends	thig.	☽ Riſes		Morn.		
14	T	At *Nottingham* 9 hours 24 min.	kne.	9	N 44	0	2	
15	F	K. GEO. II. Proclaimed	ham	10	16	0	54	
16	S	*Thunder Claps and ſtormy*	legs	10	38	1	44	
17	G	4 Sunday after Trinity	and	10	55	2	32	
18	M	Days now decreas'd 4 min.	ankl.	11	7	3	14	
19	T	Day 16 hours 39 min. long	feet	11	17	3	57	
20	W	☉ Due E. 7 h. 15 m. Alt. 29° 28′	toes	11	28	4	41	
21	T	*For the moſt part ſhow'ry*	head	11	36	5	18	
22	F	*and inclin'd to Rain*	and	11	45	5	58	
23	S	☉ Amplitude 40° 18′ North	face	11	54	6	40	
24	G	5 S. aft. Tr. St. JOHN Bapt.	neck	Morn.		7	30	
25	M	St. John's Coll. Dr. Elect.	thro.	0	12	8	18	
26	T	Days decreas'd a qr of an hour	arms	0	33	9	16	
27	W	Days 16 hours 27 min. long	ſho.	1	6	10	19	
28	T	*but concludes with fine Weather*	brea.	1	58	11	25	
29	F	St. PAUL and St. PETER	ſtom	☽ Sets		0	A 34	
30	S	Exeter Coll. Election	heart	9	N 55	1	36	

MD	Sun Riſes.		Sun Sets.		Saturn Sets.		Jupiter Sets.		Mars Riſes.		Venus Riſes.		Mercu. Sets.		Watch too faſt.	
6	3	39	8	21	12 N	1	12 N	31	2 M	28	2 M	43	8 N	43	0′	20
12	3	39	8	21	11	37	12	5	2	16	2	42	Riſes.		1	37
18	3	40	8	20	11	10	11	40	2	1	2	40	3 M	40	2	53
24	3	44	8	16	10	48	11	16	1	52	2	44	3	9	3	59
30	3	49	8	11	10	25	10	53	1	44	2	54	2	42	4	53

JULY hath xxxi Days.

M D	Day Breaks.	Twil. Ends.
6	Still no	Real
12		Night
18	0 21	11 39
24	1 15	10 45
31	1 57	10 3

Laſt Quarter 5 Day 6 min. paſt 4 Aftern.
New Moon 13 Day 37 min. paſt 1 Aftern.
Firſt Quarter 21 Day 3 q. paſt 2 Aftern.
Full Moon 28 Day 49 min. paſt 7 Morn.

1	G	6 Sunday after Trinity	back	10	N 12	2	A	35
2	M	*Now more briſk Winds,*	bow	10	25	3		30
3	T	**Cambridge Commencement**	belly	10	35	4		16
4	W	☉ Due E. 7 h 9 m Alt. 27° 20′	reins	10	46	5		4
5	T	Days decreas'd 35 minutes	loins	10	58	5		50
6	F	*attended with Showers of Rain*	ſecr.	11	12	6		36
7	S	**Thomas a Becket**	blad.	11	26	7		23
8	G	7 Sunday after Trinity	hips	11	48	8		12
9	M	☉ Amplitude 35° 56′	and	Morn.		9		2
10	T	Day 5 hour 55 min. long	thig.	0	18	9		54
11	W	*Now more cool with briſk*	kne.	1	0	10		47
12	T	*Gales of Wind, and perhaps*	ham	1	56	11		38
13	F	*ſome Showers of Rain*	legs	☽ Riſe		Morn.		
14	S	☉ Due E. 7 h 2 m Alt. 24° 52′	and	9	N 2	0		27
15	G	8 Sunday after Trinity. Swith-	ankl.	9	14	1		13
16	M	☉ Ampl. at Riſing 33° 10′ N.	feet	9	24	1		54
17	T	Days now decreas'd and Nights	toes	9	32	2		37
18	W	lengthened 1 hour 8 min.	head	9	42	3		16
19	T	Dog Days beg. Sir. riſ. Coſm.	and	9	51	3		56
20	F	*Now very hot, with ſudden*	face	10	1	4		36
21	S	*Claps of Thunder, and Storms*	neck	10	16	5		20
22	G	9 Sund. aft. Trin. Magd.	thro.	10	32	6		8
23	M	☉ Due E. 6 h 55 m Alt. 22° 4′	arms	11	2	6		58
24	T	Days 15 hours 1 qr long	ſho.	11	38	8		0
25	W	**St. JAMES the Apoſtle**	brea.	Morn.		9		5
26	T	☉ Ampl. 28° 31′	ſtom	0	48	10		11
27	F	*Still expect Thunder Showers*	heart	2	10	11		14
28	S	☉ Due E. 6 h 50 m. Alt. 20° 19′	back	☽ Sets.		0	A	15
29	G	10 Sunday after Trinity	bow	8	N 32	1		12
30	M	Days decreas'd 1 h 54 min	belly	8	44	2		4
31	T	**Princeſs AUGUSTA born**	reins	8	54	2		54

M D	Sun Riſes.	Sun Sets.	Saturn Sets.	Jupiter Sets.	Mars Riſes.	Venus Riſes.	Mercu. Riſes.	Watch too faſt.
6	3 56	8 4	10 N 1	10 N 30	1 M 36	3 M 4	2 M 28	5′ 33″
12	4 3	7 57	9 38	10 8	1 27	3 19	2 32	5 55
18	4 12	7 47	9 14	9 45	1 20	3 34	2 55	5 53
24	4 22	7 37	8 53	9 23	1 17	3 54	3 33	5 32
31	4 35	7 24	8 28	8 57	1 11	4 16	4 26	4 40

AUGUST hath xxxi Days.

M D	Day Breaks.	Twil. Ends.
First Quarter 4 Day 6 min. past 3 Morn	6 2 9	9 51
Full Moon 12 Day 7 min. past 5 Morn	12 2 29	9 31
Last Quarter 20 Day 53 min. past Midnight	18 2 50	9 10
New Moon 26 Day half an h. p. 3 Aftern	24 3 8	8 52
	31 3 26	8 34

1	W	Lammas Day	loins	9	N 7	3 A	44
2	T	*Now expect good*	secr.	9	18	4	30
3	F	*seasonable Weather*	and	9	32	5	18
4	S	*for the Harvest*	blad.	9	53	6	8
5	G	11 Sunday after Trinity.	hips	10	19	7	0
6	M	Day 14 hours 27 min. long	thig.	10	56	7	52
7	T	*Still fair with brisk*	kne.	11	50	8	46
8	W	*Gales of Wind*	and	Morn.		9	36
9	T	☉ Amplitude 18° 28′ North	ham	0	57	10	24
10	F	☉ Due East 6h. 34 m. Alt 15° 5′	legs	2	8	11	14
11	S	Day is now decreas'd & Nights	ankl	3	24	11	58
12	G	12 Sunday after Trinity	feet	☽ Rise		Morn.	
13	M	lengthen'd 2 h. 40 min.	and	7	N 45	0	40
14	T	*Still expect some brisk*	toes	7	55	1	20
15	W	*Gales of Wind, but*	head	8	4	2	0
16	T	*fair for the most part*	face	8	14	2	42
17	F	☉ Amplitude 16° 5′ North	neck	8	26	3	24
18	S	Day 13 hours 42 m. and Night	thro	8	48	4	8
19	G	13 Sunday after Trinity	arms	9	8	5	4
20	M	10 hours 18 minutes long	and	9	40	5	54
21	T	☉ Due E. 6h 25 m. Alt 10° 17′	sho.	10	28	6	54
22	W	☉ Ampl. 13° 6′ North	brea.	11	44	8	0
23	T	*But perhaps some Showers*	ston	Morn.		9	4
24	F	St. BARTHOLOMEW Ap.	heart	1	19	10	6
25	S	Days decreas'd 3 hours 27 min.	back	2	54	11	2
26	G	14 Sunday after Trinity	bow	☽ Sets		11	57
27	M	Dog Days end	belly	7	N 8	0 A	48
28	T	*now, and to the End*	rein	7	20	1	37
29	W	☉ Due E. 6h. 16 m. Alt. 6° 28′	loin	7	32	2	26
30	T	Day 12 hours 47 min. long	secr	7	46	3	16
31	F	Days decreas'd 3 h. 56 m.	blad	8	4	4	6

M D	Sun Rises.	Sun Sets.	Saturn Sets.	Jupiter Sets.	Mars Rises.	Venus Sets.	Mercu. Sets.	Watch too fast.
6	4 46	7 13	8 N 7	8 N 37	1 M 9	7 N 20	7 N 24	3′ 33″
12	4 58	7 1	7 46	8 17	1 8	7 13	7 29	2 8
18	5 10	6 49	7 25	7 57	1 6	7 3	7 18	0 28
24	5 22	6 37	7 4	7 37	1 5	6 54	7 8	1 Sl. 25
31	5 35	6 24	6 40	7 14	1 5	6 41	6 52	3 45

SEPTEMBER hath xxx Days.

	M	Day	Twil.
	D	Breaks	Ends.
First Quarter 2 Day 20 min. p. 5 Aftern.	6	3 44	8 16
Full Moon 10 Day 8 min. past 9 Night	12	3 57	8 3
Last Quarter 18 Day 39 past 10 Morn.	18	4 12	7 48
New Moon 25 Day 10 min past 1 Morn.	24	4 25	7 35
	30	4 39	7 21

1	S	☉ Amplitude 6° 48′ North	hips	8	N28	5	A 1
2	G	15 S. aft. Tr. Lond. bur. 1666	thig	9	0	5	55
3	M	☉ Due E. 6h. 11m. Alt 4° 37′	kne.	9	50	6	50
4	T	*Now expect brisk Winds*	and	10	56	7	40
5	W	*attended with Showers of Rain*	ham	Morn.		8	32
6	T	Days now decr. and Nights	legs	0	6	9	20
7	F	increas'd 4 h. 46 min.	ankl.	1	18	10	3
8	S	*Still showery for the most*	feet	2	35	10	48
9	G	16 Sunday after Trinity	and	3	52	11	28
10	M	Equal Day and Night in all	toes	☽	Rise	Morn.	
11	T	☉ ♎ half an h. past 6 Night	head	6	N22	0	8
12	W	the habitable World	face	6	32	0	50
13	T	*part about the Equinox*	neck	6	43	1	30
14	F	**Holy-Rood-Day**	and	6	55	2	15
15	S	☉ Amplitude 2° 9′ South	thro.	7	15	3	4
16	G	17 Sunday after Trinity	arms	7	43	3	59
17	M	Day 11 hours 32 min. & Night	sho.	8	31	4	57
18	T	*Now more fair and pleasant*	brea.	9	35	6	0
19	W	Ember Week	stom	10	59	7	0
20	T	12 hours 28 min long	heart	Morn.		8	2
21	F	St. MATTHEW Evangelist	back	0	33	9	0
22	S	☉ Ampl. 6° 49′ South	bow	2	8	9	56
23	G	18 Sunday after Trinity	belly	3	46	10	45
24	M	Days decreas'd 5 hours 36 min	reins	5	17	11	33
25	T	☉ Eclipted invisible	loins	☽	Sets.	0	A 23
26	W	☉ Ampl. 9° 24′ South	secr.	5	N58	1	13
27	T	*Still expect fair Weather*	blad.	6	15	2	3
28	F	*towards the End*	hips	6	34	3	0
29	S	St. MICHAEL the Arch-Ang.	and	7	8	3	53
30	G	19 Sunday after Trinity	thig	7	50	4	46

M	Sun		Sun		Saturn		Jupiter		Mars		Venus		Mercu.		Watch
D	Rises.		Sets.		Rises.		Sets.		Rises.		Sets.		Sets.		too slow
6	5	48	6	11	5	M31	6	N54	1	M 4	6	N30	6	N37	5′ 50″
12	6	1	5	58	5	14	6	34	1	4	6	19	6	23	7 55
18	6	12	5	47	4	55	6	15	1	3	6	11	6	7	9 54
24	6	24	5	35	5	38	5	56	1	2	6	0	5	49	11 45
30	6	37	5	22	4	20	5	36	1	2	5	48	5	27	13 20

OCTOBER hath xxxi Days.

	M D	Day Break.	Twil. Ends.
Firit Quarter 2 Day at 11 Morning	6	4 50	7 16
Full Moon 10 Day 52 min. paſt Noon	12	5 1	6 59
Laſt Quarter 17 Day 24 min paſt 4 Aftern.	18	5 12	6 48
New Moon 24 Day at 1 Afternoon	24	5 23	6 37
	31	5 34	6 26

1	M	Day 10 hours 46 min. long	kne.	8 N 48	5 A	40
2	T	*Now more windy with*	ham	9 56	6	32
3	W	*ſome Storm of Hail or Rain*	legs	11 11	7	21
4	T	☉ Amp. 14° 39′ South	and	Morn.	8	8
5	F	Days now decreas'd and Nights	ankl.	0 27	8	52
6	S	increas'd 6 hours 25 min.	feet	1 45	9	32
7	G	20 Sunday after Trinity	toes	2 57	10	12
8	M	*Wind and wet and*	head	4 17	10	54
9	T	*perhaps ſome Claps of Thunder*	and	5 38	11	40
10	W	☽ Ecl. inviſ.	face	☽ Riſe	Morn.	
11	T	K. GEORGE II. crown'd	neck	5 A 11	0	20
12	F	Day 9 hours 53 min. long	thro.	5 29	1	8
13	S	*Now expect ſome hoar Froſts*	arms	5 53	2	0
14	G	21 Sunday after Trinity	ſho.	6 31	2	58
15	M	☉ Amp. 24° 28′ South	brea.	7 32	3	59
16	T	*Now expect very turbulent*	ſtom	8 54	5	1
17	W	Days decr. 7 hours 14 min.	heart	10 20	6	1
18	T	St. LUKE the Evangeliſt	back	11 52	7	0
19	F	*Weather, bluſtering Winds*	bow	Morn.	7	53
20	S	Tres Mich. 1 Ret.	belly	1 25	8	44
21	G	22 Sunday after Trinity	reins	2 51	9	31
22	M	*and very ſhowery moſt part*	and	4 23	10	20
23	T	Michaelmaſs Term begins	loin.	5 49	11	8
24	W	Day 9 hours 6 min. long	ſecr.	☽ Sets.	11	57
25	T	Criſpin	blad.	4 N 37	0 A	49
26	F	*of this Month*	hips	5 6	1	41
27	S	Menſ. Mich. 2 Ret.	thig.	5 42	2	37
28	G	23 Sunday after Trinity.	kne.	6 36	3	31
29	M	St. SIMON and JUDE, Apoſt.	and	7 37	4	24
30	T	K. GEORGE II. born 1683	ham	8 52	5	14
31	W	Days decreas'd 8 hours 3 min	legs	10 11	6	2

M D	Sun Riſes.	Sun Sets.	Saturn Riſes.	Jupiter Riſes.	Mars Riſes.	Venus Sets.	Mercu. Riſes.	Watch too ſlow
6	6 51	5 8	4 M 1	6 M 51	1 M 2	5 N 38	7 M 19	14 40
12	7 3	4 56	3 44	6 35	1 0	5 31	6 16	15 36
18	7 15	4 44	3 26	6 19	0 56	5 21	5 34	16 8
24	7 27	4 33	3 5	6 4	0 49	5 15	5 32	16 15
31	7 40	4 19	2 41	5 43	0 44	5 13	5 53	15 42

NOVEMBER hath xxx Days.

	M D	Day Break	Twil. Ends
First Quarter 1 Day 24 min past 7 Morn.	6	5 42	6 22
Full Moon 9 Day 1 q past 3 Morn.	12	5 49	6 11
Last Quart. 15 Day 40 min past 11 Night	18	5 55	6 5
New Moon 23 Day 23 min past 3 Morn.	24	6 0	6 0
	30	6 2	5 58

1	T	All Saints	ham	11 N	36	6 A	45
2	F	All Souls	feet	Morn.		7	26
3	S	Cr. An. 3 R. **All Souls C.** El.	and	0	37	8	7
4	G	24 Sunday after Trinity	toes	1	53	8	40
5	M	Gun-powder-Plot 1605	head	3	6	9	29
6	T	Day 8 hours 19 min long	face	4	22	10	12
7	W	*Cold foggy with*	neck	5	42	11	0
8	T	*pretty much wet*	thro.	☽	Rise	11	52
9	F	*and cold,*	arms	3 A	51	Morn.	
10	S	☉ Amp. 34° 49′ South	sho.	4	30	0	47
11	G	25 Sunday after Trinity. Mart	brea.	5	20	1	47
12	M	Craft Mart. 4 Returns	and	6	34	2	48
13	T	Days decreased 8 hours 43 min	ſtom	8	1	3	52
14	W	*Still ſhow'ry, or*	heart	9	36	4	50
15	T	*perhaps ſome Sleets of Snow*	back	11	11	5	48
16	F	☽ Amp. 37° 6′ South	bow.	Morn.		6	35
17	S	Day 7 hours 3 quarters long	belly	0	34	7	22
18	G	26 Sunday after Trinity. Oct. M	reins	2	1	8	9
19	M	Princeſs of WALES born, 5	loin.	3	25	8	56
20	T	and Night 16 hours 1 quart.	ſecr.	4	48	9	44
21	W	*Now more mild for*	blad.	6	16	10	33
22	T	*the Seaſon, and ſo on*	hips	7	36	11	23
23	F	☉ Amp. 39° 40′ South	and	☽	Sets	0 A	18
24	S	Day decreas'd and Nights	thig.	4 N	15	1	12
25	G	27 Sunday after Trinity	kne.	5	17	2	4
26	M	increas'd 9 hours 12 min	ham	6	26	2	57
27	T	*till the end of this Month*	legs	7	42	3	48
28	W	Michaelmas Term ends	ankl.	8	58	4	31
29	T	**Baliol College** Election	feet	10	12	5	14
30	F	St. ANDREW the Apoſtle	toes	11	25	5	53

M D	Sun Riſes.		Sun Sets.		Saturn Riſes.		Jupiter Riſes		Mars Riſes.		Venus Sets.		Mercu. Riſes.		Watch too ſlow	
6	7	5c	4	9	2 M	18	5 M	19	0 M	32	5 N	12	6 M	21	14	38
12	7	59	4	0	1	57	5	7	0	24	5	13	6	54	13	4
18	8	7	3	52	1	33	4	49	0	18	5	19	7	24	11	6
24	8	13	3	46	1	9	4	30	0	7	5	30	7	54	8	45
30	8	18	3	41	0	47	4	10	11 N	58	5	40	8	22	6	3

DECEMBER hath xxxi. Days.

	M D	Day breaks	Twil. ends.
First Quarter 1 Day 43 min. past 4 Morn.	6	6 4	5 56
Full Moon 8 Day 36 min. past 3 Afternoon	12	6 3	5 57
Last Quarter 15 Day 5 min. past 8 Morn.	18	6 3	5 57
New Moon 22 Day at 8 at Night	24	5 59	6 1
First Quarter 31 Day at 1 Morn.	31	5 55	6 5

1	S	Marriage goes out	toes	0	M36	6	N 32
2	G	Advent Sunday	head	1	49	7	12
3	M	*Now cold freezing Winds*	face	3	3	7	53
4	T	*and very winterly Weather*	neck	4	27	8	38
5	W	☉ great. ampl. at Lond. 39°.50′	and	5	52	9	26
6	T	at Nottingham 41° 28	thro	7	10	10	20
7	F	Princeſs LOUISA born	arms	☽	Riſe	11	18
8	S	*Froſt and Snow*	ſho.	4	A 3	Morn.	
9	G	2 Sunday in Advent	brea.	5	34	0	21
10	M	☉ ♑ at 10 in the Morning	ſtom	7	12	1	25
11	T	The ſhorteſt Day at L. 7h. 35m	heart	8	38	2	28
12	W	at Nottingham 7 h. 18 min.	back	10	10	3	24
13	T	The greateſt ſhortening of Days	bow	11	24	4	21
14	F	at London is 8 hours 50 min.	belly	Morn.		5	8
15	S	at Nottingham 9 h. 24 min.	reins	0	58	5	55
16	G	3 Sunday in Advent	loins	2	22	6	41
17	M	**Oxf.** and **Camb.** Terms end	ſecr.	3	46	7	27
18	T	Day 7 hours 21 min long	blad.	5	11	8	15
19	W	Ember Week	hips	6	29	9	5
20	T	*Still froſty, but ſomewhat*	and	7	41	9	55
21	F	St. THOMAS, Apoſtle	thig.	☽	Sets.	10	51
22	S	*milder, tho' not very pleaſant*	kne.	3	A 57	11	45
23	G	4 Sunday in Advent	ham	5	10	0	A 36
24	M	Days increas'd 13 Minutes	legs	6	28	1	26
25	T	CHRISTMAS-DAY	and	7	44	2	13
26	W	St. STEPHEN, Proto-Martyr	ankl.	8	57	2	57
27	T	St. JOHN, the Evangeliſt	feet	10	8	3	37
28	F	Innocents—Herod's Cruelty	toes	11	20	4	16
29	S	*Froſty and pleaſant for the Seaſon*	head	Morn.		4	56
30	G	1 Sund. after Chriſtm. Princeſs	and	0	29	5	35
31	M	ELIZABETH born	face	1	47	6	14

M D	Sun Riſes.	Sun Sets.	Saturn Riſes.	Jupiter Riſes.	Mars Riſes.	Venus Sets.	Mercury Riſes.	Watch too ſlow
6	8 21	3 38	12N 16	3M 50	11 N47	5N 56	3N 33	3 7
12	8 22	3 37	11 50	3 30	11 35	6 13	3 51	0 6
18	8 20	3 39	11 24	3 8	11 20	6 28	4 15	2 faſt 53
24	8 15	3 45	11 0	2 47	11 5	6 46	4 52	5 42
31	8 8	3 52	10 30	2 22	10 50	7 6	5 20	8 40

A TABLE of all the Kings and Queens of *England*, since the Conquest.

Names.	Born.	Began to Reign.	The Length of each Reign. Y.	M.	D.	The Years expired since each Reign began and ended. Beg	End
William Conq.	1027	1066 October 14	20	10	26	678	657
William Rufus	1057	1087 Septem. 9	12	10	24	657	644
Henry I.	1058	1100 Auguſt 2	35	4	0	644	601
Stephen	1105	1135 Decem. 1	18	10	24	601	590
Henry II.	1134	1154 October 25	34	8	11	590	555
Richard I.	1156	1189 July 6	9	9	0	555	545
John	1166	1199 April 6	17	6	13	545	528
Henry III.	1207	1216 October 19	56	1	0	528	472
Edward I.	1239	1272 Novem. 16	34	7	21	472	437
Edward II.	1284	1307 July 7	19	6	13	437	417
Edward III.	1312	1327 January 20	50	5	1	417	367
Richard II.	1366	1377 June 21	22	3	8	367	345
Henry IV.	1367	1399 Septem. 29	13	5	21	345	331
Henry V.	1389	1413 March 20	9	5	11	331	320
Henry VI.	1421	1422 Auguſt 31	38	6	4	320	283
Edward IV.	1442	1461 March 4	22	1	5	283	261
Edward V.	1471	1483 April 9	0	2	13	261	261
Richard III.	1443	1483 June 22	2	2	0	261	259
Henry VII.	1457	1485 Auguſt 22	23	8	0	259	235
Henry VIII.	1492	1509 April 22	37	9	6	235	197
Edward VI.	1537	1547 January 28	6	5	8	197	191
Mary I.	1516	1553 July 6	5	4	11	191	186
Elizabeth	1533	1558 Novem. 17	44	4	7	186	141
James I.	1566	1603 March 24	22	0	3	141	119
Charles I.	1600	1625 March 27	23	10	3	119	95
Charles II.	1630	1649 January 30	36	0	7	95	59
James II.	1633	1685 February 6	4	0	7	59	55
Mary II.	1662	1689 Feb. 13	5	10	15	55	41
William III.	1650		13	0	23	55	42
Anne	1665	1702 March 8	12	4	24	42	30
George I.	1660	1714 Auguſt 1	12	10	10	30	17
George II.	1683	1727 June 11	whom God preſerve.				

A Compendious TABLE of INTEREST.

Shewing the Intereſt of any Sum of Money from a Million to a Pound; for any Number of Days, at any Rate of Intereſt.

N°.	l.	s.	d.	q.	N°.	l.	s.	d.	q.
1000000	2739	14	6	0 ,99	1000	2	14	9	2 ,14
900000	2465	15	0	3 ,29	900	2	9	3	3 ,12
800000	2191	15	7	1 ,59	800	2	3	10	0 ,11
700000	1917	16	1	3 ,89	700	1	18	4	1 ,10
600000	1643	16	8	2 ,19	600	1	12	10	2 ,80
500000	1369	17	3	0 ,49	500	1	7	5	3 ,70
400000	1095	17	9	2 ,79	400	1	1	11	0 ,50
300000	821	18	4	1 ,09	300	0	16	5	1 ,40
200000	574	18	10	3 ,40	200	0	10	11	2 ,30
100000	273	19	5	1 ,70	100	0	5	5	3 ,10
90000	246	11	6	0 ,32	90	0	4	11	0 ,71
80000	219	3	6	0 ,96	80	0	4	4	2 ,41
70000	191	15	7	1 ,59	70	0	3	10	0 ,11
60000	164	7	8	0 ,22	60	0	3	3	1 ,81
50000	136	19	8	2 ,85	50	0	2	8	3 ,51
40000	109	11	9	1 ,48	40	0	2	2	1 ,21
30000	82	3	10	0 ,11	30	0	1	7	2 ,90
20000	54	15	10	2 ,74	20	0	1	1	0 ,60
10000	27	7	11	1 ,37	10	0	0	6	2 ,30
9000	24	13	1	3 ,23	9	0	0	5	3 ,67
8000	21	18	4	1 ,10	8	0	0	5	1 ,40
7000	19	3	6	2 ,96	7	0	0	4	2 ,41
6000	16	8	9	0 ,82	6	0	0	3	3 ,76
5000	13	13	11	2 ,58	5	0	0	3	1 ,15
4000	10	19	2	0 ,55	4	0	0	2	2 ,52
3000	8	4	4	2 ,41	3	0	0	1	3 ,80
2000	5	9	7	0 ,27	2	0	0	1	1 ,26
1000	2	14	9	2 ,14	1	0	0	0	2 ,63

RULE.

Multiply the Sum by the Number of Days; and that Product by the Rate per Cent. Then cut off the two laſt Figures to the right Hand, and the reſt you muſt find in the Table.

Example, What is the Intereſt of 100 l. for 365 Days at 5 per Cent?

N°. of Days	365	Then in the Table							
multiply by	100	againſt	1000	is	2	14	9	2 ,14
Product	36500		800		2	3	10	0 ,11
multiply by	5 Rate p. Ct.		20		0	1	1	0 ,60
	1825100		5		0	0	3	1 ,15
		Anſw.	5		0	0	0	0 ,00

By Mr. J. RANDLES of *Wem* in *Shropſhire*.

Within the Sphere of the Earth's Orbit will happen four Eclipſes this Year; *twice* will the *Moon* in her wandering Courſe interpoſe and hide the Splendor of the *Sun* from falling upon the *Earth*, or its *Atmoſphere*; and twice will the *Earth* in its annual ecliptic Motion, be ſo full in a *Line* between the *Sun* and *Moon*, as to hinder her receiving the *Light* ſhe borrows from the *Sun*, to enlighten the *Earth* by Reflection.

1. Sun eclips'd *April* 1. at 10 at Night, inviſible.
2. Moon eclips'd *April* 15. viſible.
3. Sun eclipſed *Sept.* 25. at 1 in the Morning, inviſible.
4. Moon eclipſed *Oct.* 10. near Noon, inviſible.

The following *Type* of the Moon's Eclipſe, was ſent us by an *Oxonian*, who calls himſelf NICHOLAS GAMUT Eſq;

Sequitur Typus Eclipſis Lunaris, ad Methodum *Edmundi Weaver*, M. D: in cœleſti Scientia verſatiſſimi accuratiſſime delineatus; quem omni quâ par eſt Reverentiâ tanto Nomini conſecrandum volo.

1744 Aprilis Die 15.

Temporibus et Typo ſupra datis Phænomena quam proxime reſponſura ſperat humillimus Uraniæ Filius; ad Meridianum Londinenſem adaptatur Calculus. N. Gamut arm.

The Times of the ſaid Lunar Eclipſe for the following Places, as calculated, and ſent us by ſeveral of our ingenious Contributors, we ſhall exhibit in the following Table.

		Beg.	Middle	End	Dur.	Dig.
	London	7h 5'	8h 30'	9h 58'		
	Peterſburgh	9 41	11 6	12 34		
John Randles	Rome	7 57	9 22	10 50	2h 53'	8° 9'
	Wem	6 55	7 53	9 48		
	Cleobury	7 3	8 29	9 55		
	London	7 13	8 39	10 5		
W. Brown	Gibraltar	6 52	8 18	9 44	2 52	8 1
	Port-Mahon	7 30	8 56	10 22		
Abr. Lord for Leiceſter	*per* Shakerly's Tables	6 45	8 19	9 53	3 8	8 59
	Harmonicon Cæleſt.	6 49	8 22	9 55	3 6	8 45
	per Leadbetter	6 29	7 56	9 22	2 53	8 11
R. Robinſon	Guiſborough	6 47	8 15	9 44	2 57	8 33
	Gibraltar	6 25	7 53	9 22		
John Williams, Middleton Stony		7 7	8 38	9 57	2 50	8 0
	London	6 52	8 21	9 49		
John Thomas junior	St. Michaels Mount	6 30	8 0	9 30	2 57	
	Scilly Iſlands	6 25	7 55	9 25		
James Elgar for London		6 52	8 20	9 49	2 57	8 34
Ens Rationalis, Hexham		7 7	8 35	10 2	2 55	8 12
	London	6 50	8 18	9 47		
Dionyſius Williams	Paris	6 59	8 28	9 56	2 57	8 33
	Uraniburg	7 41	9 10	10 38		
	Dantzick	8 5	9 33	11 2		
Sam. Bamfield, Honiton, Leadbetter		7 3	8 18	9 33	2 30	7 2
J. Williams Whitford in Flintſhire		6 32	8 4	9 35	3 2	8 30
John Skay, Long Compton		6 51	8 18	9 45	2 54	8 24

The following Table of the *Epacts*, *&c.* is ſo plain and eaſy that it needs no Explanation; however, as our ingenious Contributor Mr. *R. Hulſe*, who ſent it us, does not doubt but it will be agreeable to our Readers, as well as ſerviceable to the Public, to inform them how it comes to paſs, that the Rule in the *Rubrick*, concerning *Eaſter Day*, comes to be controverted and anſwers not to the Purpoſe, *&c.*

For (ſays he) I find by my own Obſervation, as well as that of others, that it fails (in theſe Times) at leaſt thrice in 21 Years. This has occaſioned many to think that they have been impoſed on (at ſuch Times) by the *Almanack-Writers*, in keeping *Eaſter* a Week later than the *Rubrick*, or the Rule in the *Common-Prayer Book* hath eſtabliſhed it. For the *Rule* ſays, "*Eaſter Day* (on which all the reſt depend) is always "the firſt Sunday after the firſt Full Moon which happens "next after the one and twentieth Day of March; and if the "Full Moon happens on a Sunday, *Eaſter Day* is the Sunday "after." So if *Eaſter Day* is the Sunday after the firſt Full Moon

A TABLE of all the *Epacts*, *Easter Full Moons*, Sunday *Letters*, and *Easter* Days; both according to the *Julian* and *Gregorian* Accounts; calculated for twenty one Years, by Mr. *Ralph Hulse*.

Year of our Lord	Jul. Epa.	Greg. Epa.	Julian Easter Full ☽	Gregor. Easter Full ☽	Jul. Sunday Lett.	Gregor. Sunday Letter	Julian Easter Day	Gregor. Easter Day
1744	26	15	Mar. 18	Mar. 29	A G	E D	Mar. 25	Apr. 5
45	7	26	Apr. 5	Apr. 17	F	C	Apr. 14	18
46	18	7	Mar. 25	6	E	B	Mar. 30	13
47	29	18	Apr. 13	Mar. 26	D	A	Apr. 19	2
48	11	10	Mar. 31	Apr. 13	C B	G F	10	14
49	22	11	22	2	A	E	Mar. 26	6
1750	3	22	Apr. 9	Mar. 22	G	D	Apr. 15	Mar. 29
51	14	3	Mar. 30	Apr. 10	F	C	7	Apr. 11
52	25	14	19	Mar. 30	E D	B A	Mar. 29	2
53	6	25	Apr. 7	Apr. 18	C	G	Apr. 11	22
54	17	6	Mar. 27	7	B	F	3	14
55	28	17	Apr. 14	Mar. 27	A	E	23	Mar. 27
56	9	28	4	Apr. 15	G E	D C	14	Apr. 18
57	20	9	Mar. 24	4	E	B	Mar. 30	10
58	1	20	Apr. 12	Mar. 24	D	A	Apr. 19	Mar. 26
59	12	1	1	Apr. 12	C	G	11	Apr. 15
1760	23	12	Mar. 21	1	B A	F E	Mar. 26	Mar. 6
61	4	23	Apr. 10	Mar. 21	G	D	Apr. 15	22
62	15	4	Mar. 29	Apr. 9	F	C	7	Apr. 11
63	26	15	18	Mar. 29	E	B	Mar. 23	3
64	7	26	Apr. 5	Apr. 17	D C	A G	11	22

[ab] *Easter Full Moon not always after the 21st of March, nor Easter Day the first Sunday after its full Moon*, &c.

Moon (which so happens) What is the principal Reason that this grand Festival comes to be so oft celebrated on the second, which is quite contradictory to the foregoing Rule? My Answer is, this Rule held good for many Years after the Time of the *Nicene* Council, which was in the Year of our Redemption 322. but because the Account we keep, agrees not with the apparent Time or Motion of the Sun, it is called the *Julian*, or O. S. which was instituted by *Julius Cæsar*, about 45 Years before the Nativity of our *Saviour*; which *Julius Cæsar* perceiving the *Lunar* Course to contain

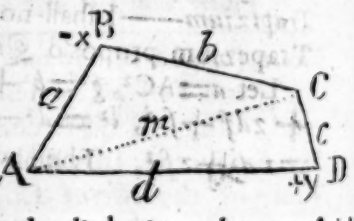
 only

only 354 Days; he, by the Advice of *Sosigenes* (an excellent Mathematician) added 11 Days and 6 Hours by reducing the Year to the apparent Time, agreeing nearly with the Course of the Sun, making it to contain 365 Days and 6 Hours; which 6 Hours every fourth Year make *Leap Year* to consist of 366 Days, whereas the other three intermediate Years contain only 365 Days, and this is what we call the *Julian Year*. Now the *Julian* exceeds the *Tropical* Year by 10′ 57″ 45‴; so that in 132 Years it will amount to one whole Day: See Mr. *Leadbetter*'s Uranf. p. 173. For if we divide the Years from the *Nicene Council* to 1744. *viz.* 1422 Years by 132 will quote nearly 11, which are the Days the *Gregorian* or N. S. is before ours, and so much has the vernal *Equinox* run back since the Time of the *Nicene Council* to this Time; which is the chief and principal Reason why the Rule in the *Rubrick* or Common-Prayer Book so often fails in this Age: But it is not by that Rule that we observe *Easter* in *England*, but by the Table in most Common-Prayer Books for finding Easter for ever; being made up of the solar *Circles* 28 Years, and of the lunar Circles 19 Years; which being multiplied together make 532 Years, the Revolution of Easter. So I hope your Readers will be convinc'd that Easter is at all Times duly celebrated by us in *England*. (tho' the Rule now determines the contrary) for the Reasons above given by *Your humble Servant*, RALPH HULSE.

Answers to the *Mathematical* Questions 1743.

The 21 Question answered by Mr. *Joseph Spilsbury*.

Put a = AB, b = BC, c = CD, d = DA, and m = AC, $-y$ = Cosine of the Angle ABC, and $+y$ = Cos. Angle ADC, then (*per* Theorem p. 12. in Mr. *Ant. Thacker's* Miscel.) we shall



have $a^2 + b^2 + 2aby = m^2$; and $d^2 + c^2 - 2dcy = m^2$ $\therefore$ $a^2 + b^2 + 2aby = d^2 + c^2 - 2dcy$, hence $2aby + 2dcy = d^2 + c^2 - a^2 - b^2$ and $y = \frac{d^2 + c^2 - a^2 - b^2}{2ab + 2dc}$ whose Sine call s, then $\frac{abs + dcs}{2}$ gives the Area of the Trapezium.

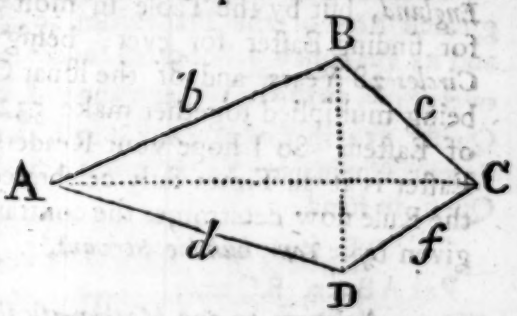
The same answered by Mr. *William Butcher*.

Suppose a=AB=15,60; b=BC=13,20; c=CD=10,00; and d=AD=26,00; also m=AC; and y the Cosine of the ∠ B or D; now if we put $f=a^2+b^2$; and $g=d^2+c^2$ (then by Prob. 4. Supplement) $f+2aby=m^2=g-2dcy$, which reduced makes $\frac{f-g}{2ab+dc}=y$ the Cosine of the Angle B or D, whose Sine call x, then will $\frac{x\times ab+dc}{2}$ be the Area=21, 5 Acres.

Mr. *Robert Wright* has very curiously solved this Question, and favoured us with an elegant Demonstration of that Theorem, delivered by *Ozanam* in the third Vol. of his *Cursus*, p. 147. viz. *Substract severally each Side from half the Sum of the four Sides, and the Square Root of the Product of the four Remainders will be the Area required.*

The same answered by Mr. *James Hemingway*.

To find the greatest Area of a Trapezium has never been thought a contemptible Problem, therefore I shall present the Publick with a Truth which perhaps was never before now discovered: (viz.) *If from the Semi-perimeter of a Trapezium we substract each Side severally; the continued Product of the four Remainders will exhibit the greatest Area of that Traptzium*——I shall now demonstrate that the Area of the Trapezium propos'd *Quest.* 21. is a *Maximum*.



Let a=AC^2, $g^2=b^2+2bc+c^2$, $h^2=b^2-2bc+c^2$, $k^2=d^2+2df+f^2$, $l^2=d^2-2df+f^2$, $m^2=2b^2+2c^2$. and $n^2=2d^2+2f^2$. Then will $\frac{\overline{m^2a^2-a^4-a^2h^2\,|\,\frac{1}{2}}+\overline{n^2a^2-a^4-a^2k^2l^2\,|\,\frac{1}{2}}}{4}$ = Area (per *Oughtred*'s Theorem) = $\frac{x^{\frac{1}{2}}+z^{\frac{1}{2}}}{4}$ which being a *Maximum*, its Fluxion $\frac{\dot{x}}{8x^{\frac{1}{2}}}+\frac{\dot{z}}{8z^{\frac{1}{2}}}$ is = 0.

Whose Fluent $\frac{m^2-2a^2}{x^{\frac{1}{2}}}+\frac{n^2-2a^2}{z^{\frac{1}{2}}}=0$.

Hence, by due Reduction, we have First,

$$\frac{d^2+f^2\times b^2c^2\,mi : b^2+c^2\times d^2f^2\,pl : b^2+c^2\,mi : d^2+f^2 :: \times bc\,df}{b^2c^2-d^2f^2} = AC^2 \text{ and}$$

$$\frac{c^2+f^2\times b^2d^2\,mi : b^2+d^2\times c^2f^2\,pl : b^2+d^2\,mi : c^2+f^2 :: \times bc\,df}{b^2d^2-c^2f^2} = BD^2$$

when the Area is a *Maximum*. Hence $b^2f^2+2bcdf+c^2d^2 = AC^2\times BD^2$ and $bf+cd = AC\times BD$ per *Extraction*; consequently a Trapezium (per *Ptolemy's* Theorem) hath the greateſt Area when it is inſcribed in a Circle. *This was finiſhed* Nov. 18, 1736.

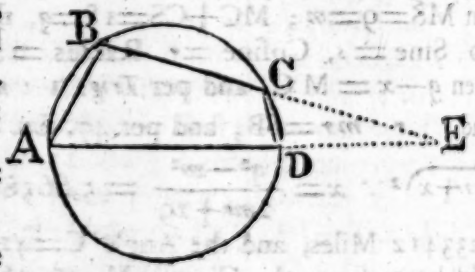
Cor. I. If $b-c=d-f$, or $b-d=c-f$; then $\overline{bcdf}^{\frac{1}{2}} =$ greateſt Area.

II. $bc+df : bf+cd :: bd+cf : \overline{AC}^2$ } when the Area is
III. $bd+cf : bc+df :: bf+cd : \overline{BD}^2$ } a *Maximum*.

Whence $\overline{4\times5\times6\times7}^{\frac{1}{2}} = 28,98275349$ Sq. Ch. is the greateſt Area of the Trapezium in *Queſt.* 56. *Ladies Diary*, and its Diagonals 7,8069938, and 7,429236 Chains. Moreover, $\overline{9\times13\times17\times19}^{\frac{1}{2}} = 37791^{\frac{1}{2}} = 194,399074$ anſwers Queſt. 134 in *Ladies Diary*; and $\overline{40242,2016}^{\frac{1}{2}} = 215,04$ Square Chains $= 21$, *a.* 2 R. 0,64 Perches, anſwers the Queſt. in hand.

The ſame anſwered by Mr. *Joſeph Sowerby*.

Put $AB=a$, $BC=b$, $CD=c$, $AD=d$; and $DE=x$; then by ſim. Triangles $a : d+x :: c : \frac{d+x+c}{a} = CE \therefore BE = \frac{ba+d+x\times c}{a}$; Again $a : \frac{ba+d+x\times c}{a} :: c : x$ hence $x = \frac{ab+cd\times c}{a^2-c^2} = 32,5$, and the Area of the Trapezium $ABCDA = 21,504$ Acres.

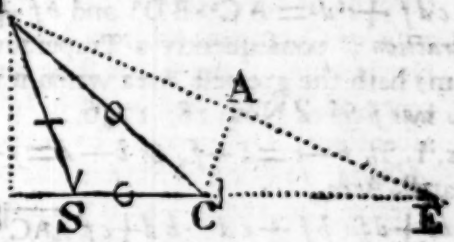


We receiv'd a great many very curious Solutions to this Queſt. from ſeveral Hands, *viz.* Mr. *William Bevil*; Mr. *William Mitchell Anaxamander*; Mr. *Robinſon*; Mr. *Rubini*, &c. &c. which not having Room to inſert, we (for the

esent) refer you to the Catalogue of Contributors at the nd of the Book, untill the Publication of the Supplement this *Diary*; which will be in *June* next, in which we ope to give more ample Satisfaction to all our Contribu-rs, *&c.* than the Room we are confin'd to at present will dmit.

Queſt. 22. Conſtructed and anſwered by Mr. *Rob. Robinſon.*

Make SM=9; the Angle S=112°. 30, E=18, the Sum of the Diſtances; join M E, which biſſect with the Perpendicular A C, and draw M C; then will S repreſent the Ship, M the Mill, and C the Church.



Calculation. In the Triangle S M E is given SM=9, SE =18, and the Angle S=112° 30′; thence find the Angle E =21°. 11′. 37″. which doubled is = the Angle SCM=42°. 23′. 14″. Hence the Mill bears from the Church N W ¼ W 12′ N^ly. Then in the Triangle SMC is known SM and the Angles, to find SC=5,66588 &c. CM=12,33412 Miles.

The *Analytic* Solution.

Let fall the Perpendicular M B upon C S produced, and put MS=9=m; MC+CS=18=q, the Angle MSB=67°. 30′. Sine=s, Coſine=r, Radius = Unity, and x = SC, then $q-x$ = M C, and per *Trig.* 1 : m :: s : ms = M B, and :: r : mr = SB; and per 47. En. 1. $\overline{q-x}^2 = m^2 s^2 + \overline{mr+x}^2$. ∴ $x = \frac{q^2-m^2}{2mr+2q}$ = 5,66588 &c. hence M C = 12,33412 Miles, and the Angle C=42°. 23′ 14″. hence the Mill bears from the Church N 47°. 36′. 46″. Weſterly.

This Queſt. was alſo truly anſwered by Mr. *John Thorpe* and others.

Queſt. 23. anſwered by Mr. *John Thompſon.*

Put m for the Cotangent of the Sun's Declination, and n for the Coſine of the Arc of 19°. 30′. = 1^h. 18′ then per Theorem in the Treatiſe of *Diary Queſtions*, by my ingeni-

ous

ous Friend Mr. *Anth. Thacker*, we've $\frac{8}{2+m^2+2n-m^2n^2}$ the verſed Sine of 141°. 54′. ½ of which is 35°. 28. 30″. the Latitude of the Place next the Equator, therefore 54°. 31′. 30″. is the greater Latitude.

The ſame anſwered by Mr. *Robert Wright*.

Call the Tangent of the leſſer Latitude = Z = the Cotangent of the greater; the Tangent of the greater Latitude = *u* = Cotangent of the Leſs; *a* = Cotang. of the Sun's Declination, *x* and *y*, for Sine and Coſine of half the Difference of Riſing, and *s* and *q* for thoſe of half the Sum of aſcenſional Differences; by Lemma, p. 367. of *Romayne's Algebra*, $sy+qx$ is Sine of the aſcenſional Difference in the greater Lat. and $sy-qx$ is the ſame in the Leſs. By Spherics 1 : Z :: *a* : $sy-qx$; and 1 : *u* :: *a* : $sy+qx$; therefore $az=sy-qx$; and $au=sy+qx$; multiply theſe together, their Product is $a^2uz=s^2y^2-q^2x^2$; but $uz=s$ ∴ $a^2=s^2y^2-q^2x^2$; alſo $q^2=s-s^2$ ∴ $a^2=s^2y^2+s^2x^2-x^2$; but $x^2+y^2=$ ∴ $a^2=s^2-x^2$ ∴ $s_{,}=a^2+x^2$; and $2s^2=2a^2+2x^2=$ the verſed Sine of the Sum of aſcenſional Differences = 55°. 37′. 52″. the half of which is = 27°. 48′. 56″. added to half the Difference of Riſing = 9°. 45′ gives 37°. 33′. 56″. the aſcenſional Difference in the greater Latitude; then as Sine 37°. 33′. 56″ : 1 :: *a* : Cot. 54°. 30′. 14″. the greater Latitude, which ſubſtract from 90°. leaves 35°. 29′. 46″ the leſſer, true to a Second.

The ſame anſwered by Mr. *John Badder*.

Before I proceed to give a Solution to this Queſtion, it may be neceſſary to premiſe the following LEMMA, viz. *If Rad.* = 1, *x* = *the Sine of an Arc leſs than* 45° *and its Co.* (*y*) *I ſay* $8x^2y^2$ = *the verſed Sine of an Arc Quadruple to that which x is the Sine of.*

Demonſtration. Per Corol. 1. p. 40. *Gent. Diary* 17[illegible] 'tis evident that $2xy=n$ = Sine of an Arc double to *x*, $4x^2y^2=n^2$ and $8x^2y^2=2n^2$ = the verſed Sine of an Arc double to *n*, and conſequently quadruple to *x*. Q. E. D.

Solution. Firſt we may obſerve that the given Difference viz. 1ʰ. 18′ = 19°. 30′. is the Difference of the Arcs of aſcenſ[illegible]

cenſional Difference; the Nat. Sine and Coſ. of half which (viz.) 9°. 45′. call (*a*) and (*b*) reſpectively. The Tang. of the Sun's Declination (viz.) 23°. 29′ call (T) its Cotang. (*t*) and let (*x*) and (*y*) repreſent the Sine and Coſ. of half the Sum of the Arcs of aſcenſional Difference, and Rad.= (1.) Then the Sines of the aſcenſional Difference in the greater and leſſer Latitudes will be expreſſed by $xb+ya$, and $xb-ya$ reſpectively; And by a well known Analogy Rad. Tang. Lat :: Tang. Sun's Dec. Sine of aſcenſional Diff. ∴ Alternately, Tang. Decl. Sine of aſcen. Diff. :: Rad. Tang. Lat. Hence we have $\frac{xb+ya}{T} = Z$ the Tangents of the greater Lat. and $\frac{xb-ya}{T} = v$, the Tangent of the Leſs. And becauſe Radius is a mean Proportion between any Tang. and its Cotang. we have the Cotang. of the greater Lat. $= \frac{T}{xb+ya} = \frac{xb-ya}{T} = v$, the Tang. of the leſs per Queſt.

∴

	1	$\frac{T}{xb+ya} = \frac{xb-ya}{T}$, which brought out of Fractions
will be	2	$T^2 = x^2b^2 - y^2a^2$, ſubſ. for (y^2) its value $(1-x^2)$ reduce and
we'ye	3	$T^2+a^2 = x^2$. Now ſub. $(1-y^2)$ for (x^2) in *Step.* 2, reduce and
then	4	$b^2-T^2 = y^2$
4—3	5	$b^2 - a^2 - 2T^2 = y^2 - x^2$; But (per Equat. to Cor. 1. p. 40 *Gent. Diary* 1741.) b^2-a^2 is the Coſ. of an Arc double to that which (*a*) is the Sine of (*viz*) $b^2 - a^2 =$ Coſ. 19°. 30′.) and $y^2 - x^2 =$ Coſ. of the Sum of the Arcs of aſcen. Diff. Hence from the 5 Step, and the above Analogy, we have (for ſolving all ſuch Problems as the above) the following general Theorem.

From the Coſine of the given Diff. of Time, ſubſtract twice the Square of the Sun's Decl. the Remainder will be the Coſ. of an Arc; to which add the Arc of the given Diff. of Time; the Sine of half which call (s) then will (t) = Tang. of the greater Latitude.

But, general Expreſſions for both Latitudes may be found thus; From Steps 3 and 4 we have $x = \sqrt{a^2+T^2}$, and $y = \sqrt{b^2-T^2}$ ſubſtitute thoſe values of x and y, in the above Equations for the Latitudes, and we ſhall have

$$\frac{b\sqrt{a^2+T^2}+a\sqrt{b^2-T^2}}{T} = b\sqrt{a^2t^2+1}+a\sqrt{b^2t^2-1}$$

$$= Z \& \frac{b\sqrt{a^2+T^2}-a\sqrt{b^2-T^2}}{T} = b\sqrt{a^2t^2+1}-a\sqrt{b^2t^2-1}$$

$= v.$

But, to find a more ſimple Expreſſion for one of the re Latitudes or ſome known part of it, I proceed thus. If and v expreſs the Tangents of each Lat. (as before) the $\sqrt{z^2+1}$, and $\sqrt{v^2+1}$ will expreſs the Secants, al

$\frac{z}{\sqrt{z^2+1}} = y$; and $\frac{v}{\sqrt{v^2+1}} = x$, will expreſs th Sines of the greater and leſſer Lat. reſpectively. Theſe i Terms of the above Value of x and v, will be

$$b\sqrt{a^2t^2+1}+a\sqrt{b^2t^2-1}$$

$$\sqrt{2a^2b^2t^2+2b^2+\sqrt{4a^4b^4t^4-4a^4b^2t^2+4a^2b^4t^2-a^2b^2}}$$

$$b\sqrt{a^2t^2+1}-a\sqrt{b^2t^2-1}$$

and $\sqrt{2a^2b^2t^2+2b^2-\sqrt{4a^4b^4t^4-4a^4b^2t^2+4a^2b^4t^2-a^2b^2}}$

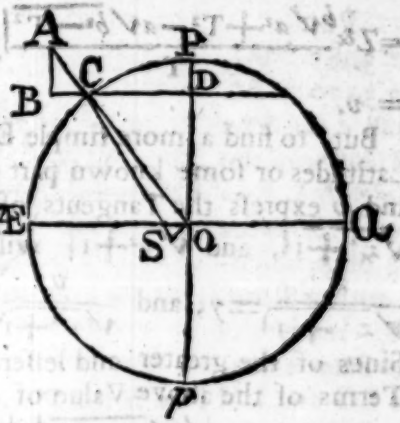
$= x$; the Rectangle of theſe two Equations when reduced

$$\frac{1}{\sqrt{4a^2b^2\times a^2+b^2+4b^2\times a^2+b^2}} = xy$$; but $a^2+b^2=1$

$$\frac{1}{\sqrt{4a^2b^2t^2+4b^2}} = xy \; ; \; \therefore \; \frac{1}{4a^2b^2t^2+4b^2} = x^2y^2$$; and

$\frac{1}{a^2b^2t^2+b^4} = 8x^2y^2 = 1,78782$ (which per Lemma) is the verſ. Sine of four Times the leſſer Lat. but, becauſe there are no Tables extant (that I know of) of verſ. Sines to Arc of above 90°. I ſubſtract Rad. $= 1$ from the above N°. and there remains ,78782 = the Coſ. of 38°. 0′. 30″. which added to, and ſub. from 180°. will give 218°. 0′. 30″. and 141°. 59′. 30″. $\frac{1}{4}$ of which gives 54°. 30′. 7″ $\frac{1}{2}$ and 35° 29′. 52′ $\frac{1}{2}$ for the greater and leſſer Latitudes reſpectively. Q. E. I.

Quest. 24. answered by *Nicholas Gamut*, Esq;



Let the annexed Figure
resent the Earth; it is
dent the Line of Direc-
n of heavy Bodies, will
s through the Centre no
here but from the Poles
Equator, in all other
sitions, as A C it will be
rried into the Position AB
the *centrifugal* Force of
e Body B; let AC repre-
nt the Force of Gravity;
B the *centrifugal* Force. The
tio of these Forces, namely, 458,43 to 1, will be known
eing as the Rad. to the Cosine of the Latitude compounded
ith the Ratio of the Force of Gravity, to the *Centrifugal*
the Equator, or with the Ratio of 289 to Unity) then in
e Triangle ACB, we have the Angle at C=51°. and the
roportion of AC to CB the containing Sides, whence the
ngle of Direction of heavy Bodies in Lat. 51°. is 5′. 50″.
=BAS=SCO; now let CS be the Path of the Stone or a
rpendicular to the Earth's Surface, the Semidiameter of
the Parallel CD = y, put $\frac{1}{2}$ Æ Q = t. PO = c, T = the
angent of the Latitude, DO = x, then y = 2515,6 Miles,

d from the Curve $x = \frac{\sqrt{c^2 t^2 - t^2 y}}{c^2}$ = 3084, 4 Miles;

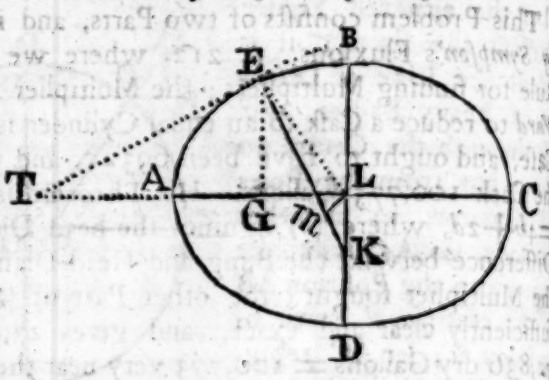
hence CO = $\sqrt{x^2 + y^2}$ = 3980,2 Miles. Now in the
riangle CSO we have all the Angles, and one Side, there-
re SO the Distance from the Centre where the Line of
irection cuts the Diameter is 10.7094 Miles; and CS =
971,88 Miles.

N.B. *There are several ways of solving this Problem, one of which is deducible from the Method of drawing Tangents to an Ellipse, but that is the least exact and philosophical.*

The

The same answered by *Vulpes Dunelmensis*.

PUT $b = 3987 = AL$, $d = 3970 = BL$, s and c = Sine and Cosine of the Angle A L E = 51°. Suppose EK perpendicular to the Tang. T E, and let fall the Perpendiculars EG and LM; m is the Place of its final Rest, and Em the Distance gone thro'; to find which let $x = EL$, and per Trig. $1 : x :: s : sx = EG$; and $1 : x :: c : cx = GL$, hence $b + cx = GC$, and $b - cx = AG$; and per common Properties $b^2 : d^2 :: b^2 - c^2x^2 : s^2x^2$; hence $b^2 s^2 x^2 = b^2 d^2 - d^2 c^2 x^2$; here x is found $= \frac{\sqrt{b^2 d^2}|}{b^2 s^2 + d^2 c^2}$; or if t = the Tangent 51°, then $t = \frac{s^2}{c^2}$ and $b^2 s^2 + d^2 c^2 = c^2 \times b^2 t^2 + d^2$; also $\frac{\sqrt{b^2 d^2}|}{b^2 s^2 + d^2 c^2} = \frac{bd}{c\sqrt{b^2 t^2 + d^2}|} = EL = 3976{,}7067$; and by substituting the Value of x last found in the above Equations $cx = GL$, and $sx = EG$, we shall then have $\frac{bd}{\sqrt{b^2 s^2 + d^2 c^2}|} = GL = 2502{,}62$; and $\frac{tbd}{\sqrt{b^2 t^2 + d^2}|} = EG = 3090{,}49$; and from hence Em, the Space gone thro' by the Stone will be found $= 3976{,}67$ Miles; and mL the Distance from the Centre $= 16{,}6$ Miles.



This Question was also truly and methodically answered by Mr. *Jos. Sowerby*, Mr. *Charles Smith*, Mr. *Sam. Farrer*, Mr. *John Williams*, Mr. *Tho. Worcester*, Mr. *Tho. Ramshay*, Mr. *William Sutton*, Mr. *John Matthews*, and several others, as will appear in the Catalogue, and which shall more fully be specified in the Supplement.

The

The 25 Queſt. anſwered by *Nicholas Gamus*, Eſq;

This Problem conſiſts of two Parts, and is eaſily ſolved by *Sympſon*'s Fluxions, p. 212. where we have a general Rule for finding Multipliers; the Multiplier made uſe of by *Ward* to reduce a Caſk to an equal Cylinder is wrong in this Caſe, and ought to have been 69325, and the Content of the Cask 100,775 Gallons. His Theorem is $3m\,zd+6h\,m=4h+2d$, where (h) ſignifies the head Diameter, (d) the Difference betwixt the Bung and Head Diameters, and (m) the Multiplier ſought; the other Part of *Ward*'s Proceſs is ſufficiently clear and exact, and gives 27,937 wet, and 72,836 dry Gallons = 100,773 very near the true Content.

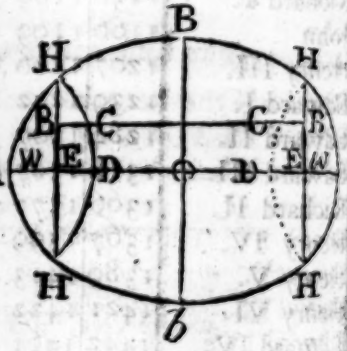
The ſame anſwered by *Anaxamander*.

Let $l=\frac{1}{2}$ the Length, $q=\frac{1}{2}$ the Difference between the Bung and Head Diam. $v=$the wet Inches at the Bung, $d=$the Dry; and $m=$the Diviſor for Ale or Wine Gall. then will it be $\sqrt{vd}\times\frac{v}{3}+\frac{v^2}{3\cdot5\cdot d}-\frac{v3}{3\cdot5\cdot7d^2}+\frac{v4}{3\cdot5\cdot7\cdot9\,d^3}$ &c. = the Area of the wet Inches at the Bung. Let the dry Inches be divided by the wet, and call the Quotient (p), then for d ſubſtitute its Equal pv, and we ſhall have $\frac{v^2 4\sqrt{p}}{3}\times1+\frac{1}{5\cdot p}-\frac{1}{5\cdot7p^2}+\frac{1}{5\cdot7\cdot9p^3}$ &c. Now let $1+\frac{1}{5\cdot p}-\frac{1}{5\cdot7p}+\frac{1}{5\cdot7\cdot9p^3}$ &c. $=c=1{,}0932366$ and $\frac{4c\sqrt{p}}{3m}=b$, then $bv^2=$the Area of the lower Segment, at the Bung, and to find the ſame at any Diſtance z. let $y=$ the wet Inches at that Diſtance. Then from the Nature of the Curve we have $v-y:z^2::q:l^2\;\therefore\;y=v-\frac{qz^2}{b^2}$, which ſubſtituted in the above Expreſſion for v, will be $b\times v^2-\frac{2vqz^2}{l^2}+\frac{q^2z^4}{b^2}\times z$ will give the Fluxion of the Solid of the wet Inches; whoſe Fluent when $z=l$ will be half the Quantity of

of Liquor in the Cask; hence this Theorem $2l \times b \times v_a - \frac{2vy}{3} + \frac{4l^3}{5}$ = the Ullage = 27,07925 Ale Gallons.

The same answered by Mr. *Spilsbury* the Proposer.

Put $l = AO$, $b = BO$, $x = EO$; and let any Ordinate as $EH = ED = y$; and for any Distance EB of the generating Circle HCDHwH = x, which will always be half the Difference betwixt the wet and dry Inches; Then the Area of the generating Plain, *viz.* double the Area EBCDE will be expressed by $2yx - \frac{x^3}{3y} - \frac{x^5}{4 \cdot 5y^3}$ &c. But by Nature of the Curve, &c. $\frac{-b\dot{y}}{2\sqrt{b^2-by}} = \dot{x}$ the Fluxion of EO (or the Velocity with which the generating Plain moves) which drawn into $2yx - \frac{x^3}{3y} = \frac{x^5}{4 \cdot 5y^3}$ &c. gives



$\frac{-bx\dot{y}y}{\sqrt{b^2-by}} + \frac{lx3\dot{y}}{2.3y\sqrt{b^2-by}} + \frac{lx5\dot{y}}{8.5y^3\sqrt{b^2-by}}$ &c. the Fluxion of the Solid required, whose Fluent is $\frac{2by}{3b}\sqrt{b^2-by} + \frac{4l}{3}\sqrt{b^2-by} - \frac{-lx}{6b}$ $\times$ L: $\frac{b+\sqrt{b^2-by}}{b-\sqrt{b^2-by}}$ &c. or if for $l\sqrt{b^2-by}$ we put its Value bz, we get $\frac{2yz}{3} + \frac{4bz}{3} - \frac{x^3}{6\sqrt{b^2-by}} \times$ L: $\frac{b+\sqrt{b^2-by}}{b-\sqrt{b^2-by}}$ &c. Which Expression being added to, or subtracted from the Semi-Cask's Content, gives the Quantity of the Vacuity sought.

This

This Queſt. was alſo anſwered by Mr. *Badder*, Mr. *Worceſter*, Mr. *Lord*, Mr. *Whitehead*, Mr. *Rubins*, and ſeveral others. See the Catalogue.

The 26 Queſt. anſwered by Mr. *John Matthews*.

Let $ax^n = y^m$, then $a^{\frac{1}{m}} x^{\frac{n}{m}} = y$; and $a^{\frac{1}{m}} x^{\frac{n}{m}} \dot{x}$ = Fluxion of the Area $\therefore$ Area $= \frac{m}{n+m} a^{\frac{1}{m}} x^{\frac{n}{m}+1} = \frac{m}{n+m} xy$; which compar'd to the given Equations, gives ,8xy, and ,25xy for the Areas; therefore $\frac{59.4}{,8-,25} = xy = 108.2xy = 216$ $x^2+y^2 = \overline{15}|^2$ $x^2 \pm 2xy + y^2 = \left\{\begin{matrix}441\\9\end{matrix}\right\}$ $x \pm y = \left\{\begin{matrix}21\\3\end{matrix}\right\} \therefore x = 12$ $y = 9$.

The ſame anſwered by Mr. *John Robinſon*.

Here is given the Equation of the Curve AEM, (ſee Fig. p. 38. in the laſt Year's *Diary*) $= a\,x = y^4$. Ergo $\dot{x} = \frac{4y^3\dot{y}}{a}$, and the Fluxion of the Area will be $\frac{4y^4\dot{y}}{a}$, whoſe Fluent is the Area $= \frac{4}{5} y\,x$. Again, the Equation of the Curve AFm is $ax^3 = y$, this flux'd is $3ax^2\dot{x} = \dot{y}$; hence $x\dot{y} = 3ax^3\dot{x}$, whoſe Fluent is $\frac{3}{4} ax^4$. Ergo the Area of the Curve AF$m = \frac{1}{4} yx$; hence the Area is $\frac{11xy}{20} = 59,4 \therefore xy = 108$; and per 47 *Eu.* 1. $x^2+y^2 = 225 = m \therefore xy = y\sqrt{m^2-y^2} = 108 = q$ ſolv'd $y = \sqrt{\frac{1}{2}m + \sqrt{\frac{m^2-q^2}{4}}} = MP = 12$; hence AP$=9$.

The ſame ſolv'd by Mr. *John Thompſon*.

Call AP, x; Pm, y; A$m = 15\,n$; $59,5 = b$; then $y\dot{x}$ = the Fluxion of the Space AEmP; but per Equation of the

Curve AE*m*, $ax = y^4$ in Fluxions $ax = 4y^3y \therefore x = \frac{4y^3y}{a}$ $\therefore \frac{4y^3y}{a}$ = Fluxion of the Space AE*m*P, whoſe Fluent is $\frac{4y^5}{5a}$; for y^4 put ax, then $\frac{4yx}{5}$ = Area of the Space AE*m*P; and per Equation of the Curve AF*m*; $ax^3 = y \therefore ax^3x =$ the Fluxion of the Space AF*m*P, whoſe Fluent is $\frac{ax^4}{4}$; for x^3 put $\frac{y}{a}$, then $\frac{yx}{4}$ = Area of the Space AF*m*P; then $\frac{4yx}{5} - \frac{yx}{4} = b$ out of Fractions is * $11yx = 20b$, ſquar'd is $121y^2x^2 = 400b^2$; but (per 47 *Eu.* 1.) $n^2 - x^2 = y^2 \therefore 121x^2n^2 - 121x^4 = 400b^2$, which divided by 121. and ſquare Com. and Root extracted $x^2 = \frac{n^2}{2} + \sqrt{\frac{n^4}{4} - 3{,}305785\,b^2}$ $\therefore x = \sqrt{\frac{n^2}{2} + \sqrt{\frac{n^4}{4} - 3{,}305785b^2}}$ $= 12 = AP \therefore y = 9 = Pm$. Q. E. I.

But, to ſolve this Problem by a ſimple Equation, put Rad. = (1) and v and z to expreſs the Sine and Coſine of the Angle A, then per Trig. $\begin{cases} 1 : n :: v : nv = y \\ 1 : n :: z : nz = x \end{cases} \therefore n^2vz = yx$; which put for yx in the * Equation above, gives $11n^2zv = 20b \therefore zv = \frac{20b}{11n^2} \therefore 2zv = \frac{40b}{11n^2} = ,96$, which anſwers in the Tables to 73° 44′; nearly half of which is 36° 52′ = Angle A; then per Trig. $x = 12$, and $y = 9$ as before.

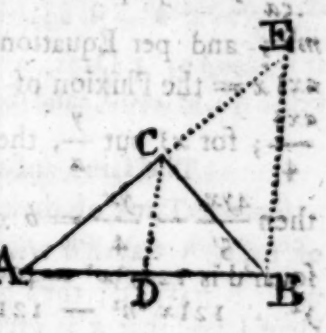
This Queſt. was alſo ſolv'd by Mr. *Samuel Farrer*, *Nich. Gamut*, Eſq; Mr. *Joſ. Sowerby*, Mr. *Geo. Ingman*, Mr *John Aſh*, Mr. *John Coley*, and ſeveral others, as will appear in the Catalogue.

The 27 Queſt. anſwered by Mr. *Sam. Farrer*.

Draw CD biſſecting the given Angle ACB produce AC, and make CE = CB, joining BE; then by ſimilar Trian-

gles,

gles, as, AB : AE :: DB : BC :: the Sine of the Angle DCB : to the Sine of the Angle CDB, becauſe the Sines of plain Triangles are in the ſame Ratio, as the Sides oppoſite to thoſe Angles; Therefore if from the Angle BDC, and alſo from its Complement, be taken half the Angle ACB, there will remain the Angle CAB = 41° 47′ 37″; the Angle CBD = 48° 12′ 23″ AC = 22,366423 Chains, and CB = 19,993577.



N. B. *This Method is general, let the Angle* ACB *be what it will.*

The ſame anſwered by Mr. *Tho. French.* Let x and y = Sine and Coſine of the Angle CAB; h the Hypotheneuſe, and s = the Sum of the Sides AC + CB. Then per Trigonometry, $1 : h :: y : hy$ = CA; and $1 : h :: x : hx$ = CB; Hence $hx + yh = s$ = AC + CB $\therefore x + y = \frac{s}{h}$ which ſquared is $x^2 + 2xy + y^2 = \frac{s^2}{h^2}$. But (per 47 Eu. 1.) $x^2 + y^2 = 1 \therefore 1 + 2xy = \frac{s^2}{h^2}$ = the verſed Sine of twice the greater acute Angle. Hence the Baſe and Perpendicular will be found = 22,36, and 20 Chains nearly. Or, according to Mr. *William Brown*, $\frac{s^2}{h^2} - 1$ = Sine of double the leſs acute Angle.

This Queſt. was very methodically ſolv'd by Mr. *Thomas Mitchel*, Mr. *Richard Smith*, Mr. *William Chapple*, Mr. *William May*, Mr. *John Thorpe*, Mr. *Tho. Peat*, Mr. *Will. Jepſon*, and ſeveral others.

The 28 Queſt. anſwered by Mr. *Charles Smith.*

Let d = 12 Hours the Length of the Day, c = 150; b = 123 = the Number of Miles they will go in four Days; and ſuppoſe A to proceed in Geom. Progreſſion, his Journey the fifth Day will be 80 Miles, and B. in Arith. Progreſs 22 Miles; hence 'tis evident they will meet ſome time on the fifth Day; let x = the Time ſought, then (ſuppoſing

ſing them to proceed uniformly) it will be $d : 80 :: x : \frac{80x}{d}$ = the Miles A travels; and $d : 22 :: x : \frac{22x}{d}$ = the Miles B travels, and per Queſt. $\frac{102}{x} + b = c$, therefore $x = \frac{dc-db}{102} = 3^h.\ 10'\ 35,''292$. Conſequently they will meet at the end of 4 Days, $3^h.\ 10'\ 35''$; when A will have travell'd 96,176466, and B 53,823528 Miles.

The ſame anſwered by Mr. *Sam. Farrer*.

For the Time of their meeting put x, then the Number of miles A travell'd will be $5\overline{\times 2|}^x - 5$; and $2x^2 + 4x$ the miles B travell'd; then per Queſt. $5\overline{\times 2|}^x + 2x^2 + 4x = 155$. Here I find that x is greater than 4, and leſs than 5. Suppoſe $4 + z = x$, and the Equation above, by Diviſion, &c. will become $\overline{2|}^{4+z} + 4z^2 = 21,4$ put $\overline{2|}^4 = b$, and the Hyp. Log. of $2 = m$; then the Hyp. Log. $\overline{2|}^{4+z}$ will be $4m + mz$, but the abſolute Number anſwering to $4m = 16$, or b, and that anſwering to $mz = 1 + mz + \frac{m^2z^2}{2} + \frac{m3z3}{2.3} + \frac{m4z4}{2.3.4}$ &c. Therefore $b + bmz + \frac{bm^2z^2}{2} + \frac{bm3z^3}{2.3} + \frac{m4z4}{2.3.4}$ &c. $+ 4z^2 + 4z = 21,4$ and by reverſing the Series, z will be found $= ,3257 \therefore x = 4\ 3257$; conſequently A travell'd 95,261, and B 54,739 Miles.

The ſame anſwered by Mr. *William Butcher*.

Suppoſe $s = 150$, $x =$ the Time, then $5\times 2^{x-1}$ is the laſt Term in the Geom. Progreſſion $\therefore 5\times 2^x - 5$ is the Miles A went. And $4x - 4 + 6 = 4x + 2$ is the laſt Term in the Arith. Progreſſion; Then $4x + 2x^2$ is the Miles B travell'd, See *Ward*, p. 186. But $5\times 2^x - 5$ added to $4x + 2x^2 = s$ *per Qu.* which being reduced, and divided by 5, becomes $31 -, 8x -, 4x^2 = 2^x$; then by the common Method it would be Log. of $31 -, 8x -, 4x =$ Log. $2\times x$; which being very troubleſome, I chooſe to approximate to the unknown

known Quantity x thus, by Trials I find x something more than 4; then I put 4 for x in the two first Terms, and $4+e$ in the last, and the Equation will stand thus $31-,8\times 4-4\times 4^2=21,4=2^{4+e}$; Therefore L. 21,4 = L. $2\times 4+e$; and $\frac{\text{Log. } 21,4-\text{Log. } 2\times 4}{\text{Log. } 2}=e$; which added to 4 for a new x, and so repeating the Operation x will be found = 4,3256 very near their Time of meeting. Hence A travell'd 95,25, and B 54,76 Miles.

This Question was also curiously answer'd by Mr. *W. Wallhead*, Mr. *R. Hancock*, Mr. W. *Jepson*, *Tom. Cabbage*, Mr. *John Clack*, Mr. *W. Aldridge*, Mr. *W. May*, Mr. *Tho. Moss*, Mr. *Rich. Evans*, and several others, whom we shall endeavour to oblige in the Supplement.

The 29 Quest. answered by *Ens Rationalis*.

Let ABD be a Section of the Pyramid, and suppose $x=$ AC, and $y=$CD; then $\frac{4x^2y}{3}=51,54863\times 2150,42=110851,2049246$ Inches; whence $x^2y=83138,40369345=b$; and $y=\frac{b}{x^2}$. But per 47 Eu. 1. $x^2+\frac{b^2}{x^4}=$ AD, which by the Qu. must

be a *Minimum* $\therefore 2x\dot{x}=\frac{4b^2x3\dot{x}}{x^8}=0$

whence by Rad. $x^6=2b^2$ $\therefore x3=\overline{2|}^{\frac{1}{3}}\times b$, and $x=\overline{2|}^{\frac{1}{6}}\times b^{\frac{1}{3}}$; Hence $2\times\overline{2|}^{\frac{1}{6}}\times b^{\frac{1}{3}}$; $\frac{3}{4\sqrt{2|}}\times b^{\frac{1}{3}}$; $\frac{\sqrt{9+2\times 16\times\overline{2|}^{\frac{1}{3}}}}{4\sqrt{2}}\times b^{\frac{1}{3}}$; $\frac{\sqrt{9+2\times 16\times 2|^{\frac{1}{3}}}}{2|^{\frac{1}{3}}}\times b^{\frac{1}{3}}$ are general Expressions for the Base, Altitude, slant Height, and superficial Content respectively; which in the present Case are 97,979; 34,64; 60; and 11757,546.

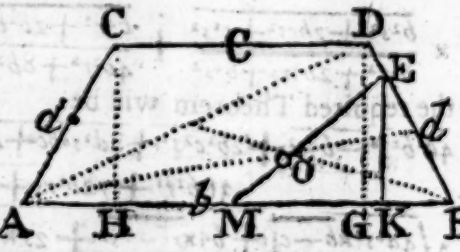
The same answered by *Vulpes Northumb.*

Let x = the Altitude of the Pyramid in Inches, then $\frac{3a}{x^2}$ = Area of the Base and $\sqrt{\frac{3a}{4x}}$ = the Distance from the Centre of the Base to the middle of the Side, then $\sqrt{\frac{3a}{4x}+x^2}=z$ the slant Height; this in Fluxions is $\frac{128x\dot{4}x-48a\dot{x}x}{96a\dot{x}^2+128x^3}=0$; this reduc'd is $x=\sqrt[3]{\frac{12a}{32}}=\frac{\overline{3a}|^{\frac{1}{3}}}{2}$ = 34,64 the perpend. Height. Hence $\overline{2}|^{\frac{1}{2}}\times\overline{3a}|^{\frac{1}{3}}=y=$ 97,979 the Side of the Base; $\frac{\overline{3}|^{\frac{1}{2}}}{2}\times\overline{3a}|^{\frac{1}{3}}=z=60$, the slant Height; and $\overline{6}|^{\frac{1}{2}}\times\overline{3a}|^{\frac{2}{3}}=2yz=11757,456$ the required Superficies.

This Question was also truly answered by Mr. *Abr. Lord*, Mr. *Tho. Fisher*, Mr. *James Rubins*, Mr. *John Prichard*, Mr. *Sam. Bamfield*, Mr. *James Hemingway*, Mr. *Tho. Mather*, and several others.

The 30 Question answered by Mr. *Joseph Colson.*

Let $AH=\frac{1}{2}b-\frac{1}{2}c=\frac{b-c}{2}$ $CH=\sqrt{\frac{d^2-b^2-2bc+c^2}{4}}$ and $CH\times\frac{b+c}{2}=$ Area of the Trapezium, which let be $=A$. Then (per Quest.) $\frac{sA}{r}$ = Area of the Triangle $\therefore\frac{sA}{\frac{1}{2}br}=EK\therefore\sqrt{\frac{s^2A^2}{\frac{1}{4}b^2r^2}+\frac{c^2}{4}}=EB$ $\therefore\frac{1}{2}\sqrt{\frac{s^2A^2}{\frac{1}{4}b^2r^2}+\frac{c^2}{4}}=MO.$ Q. E. I.



The same answered by *Vulpes Dunelmensis*.

Divide each Side of the Triangle into two equal Parts, from whence draw Lines to the opposite Angles, the Point (O) where they intersect is the Centre of Gravity. Let fall the Perpendiculars D G, E K; and let $x = OM$, the Distance sought; then $3x = ME$, and $\frac{b-c}{2} = GB$; hence (per 47 Eu. 1.) $DG = \sqrt{\frac{4d^2 - b^2 + 2bc - c^2}{4}}$ for which put n, and you'll find the Area of $ACDB = \frac{bn+cn}{2}$; the Area of the Trapezia $ACDE = \frac{brn+crn}{2r+2s}$; and the Area of the Triangle $ADB = \frac{bn}{2}$; but Triangles that have the same Base, are to each other as their Altitudes $\therefore \frac{bn}{2} : n :: \frac{bsn+csn}{2r+2s} : \frac{bsn+csn}{br+bs} = EK$, and per similar Triangles $BK = \frac{b^2s+c^2s}{2br+2bs}$; Hence $MK = \frac{b^2r+c^2s}{2br+2bs}$; and (by 47 Eu. 1.) we have this Equation n^2, or $\frac{4d^2 - b^2 + 2bc - c^2}{4} \times \frac{b^2s^2+2bc^2s^2+c^2s^2}{b^2r^2+2b^2rs+c^2s^2} + \frac{b^4r^2+2b^3c^2rs+c^4s^2}{4b^2r^2+8b^2rs+4b^2s^2} = 9x^2$; whence the required Theorem will be

$$\frac{4d^2b^2s^2 - b^4s^2 + 2b^2c^2s^2 + 8d^2s^2bc + 4d^2c^2s^2 + b^4r^2 + 2b^2c^2s}{36b^2r^2 + 72b^2rs + 36b^2s^2} = \sqrt{\frac{4d^2s^2 \times b - c}{6b \times r + s} + \frac{b^4 \times r^2 - s^2 + 2s \times r + s \times b^2c^2}{6b \times r + s}} = x = MO$$

The same answered by Mr. *William Butcher*.

Suppose $m = b + c$; $n = \frac{b-c}{2} = BG$; p and $q = DG$ and EK perpendicular to AB; a = Area of the Trapezium ACDE.

ACDE. Then $\frac{mp}{2}$ = the Area of ACDB and $\frac{sa}{r}$ = Area of the Triangle AEB; $\frac{sa}{r} + a = \frac{mp}{2} \therefore \frac{rmp}{2xs+r} = a$; which multiplied by $\frac{s}{r} = \frac{smp}{2xs+r}$ = Area of the Triangle, which divided by $\frac{b}{2}$ is $\frac{smp}{bxs+r} = q$; then as $p : d :: q :$ EB $= \frac{smd}{bxs+r}$; and $d : 1 :: n : \frac{n}{d}$ = Coſine of the Angle B; having which, and the Sides BE, and BM = half (b) to find the ſide EM (by Problem 4 of the *Supplement*) $\frac{s^2m^2d^2}{b^2xs+r^2} + \frac{b^2}{4} - \frac{smn}{s+r} = \overline{EM}|^2 \therefore \frac{1}{3}$ of EM is the Diſtance that the Centre of Gravity muſt be from the Centre of the Baſe b; and if the former Quantities be reſtored, then

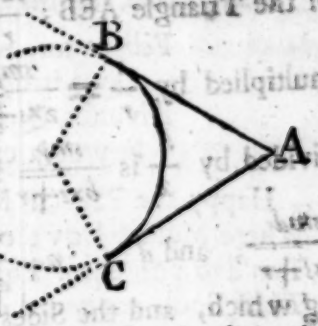
$$\left| \frac{s^2d^2xb+c^2}{b^2xs-r|^2} + \frac{b}{4} - \frac{sxb+cxb-c}{2xs+r} \right|^{\frac{1}{2}}$$

divided by 3, gives the Diſtance of the Centre of Gravity. Q. E. I.

We once more return Thanks to our kind Contributors, hoping for the Continuance of their Favours; ſtill promiſing conſtantly to avoid the leaſt Degree of Partiality and to make it our utmoſt Care and Endeavour to do to each all the Juſtice poſſible; and what valuable and ingenious Queſtions, or Solutions, &c. we may receive, which the Room we are confin'd to in the Diary will not allow us to inſert, we purpoſe yearly to publiſh in a Supplement, of the ſame Size and Price with the Diary, for the Conveniency of Binding; but deſire them to take Notice, that whatever Letters are directed for the Authors, *will not be received unleſs* Poſt paid.

The

The PARADOX answered by Mr. *John Matthews*.



From 16 Eu. 3. it appears that the Angle made by an Arc of a Circle, and its Tangent is leſs than any right lin'd Angle whatſoever, therefore infinitely ſmall, or equal to nothing (and the ſame alſo may be ſaid of the other Curve.) If then the third Side of the Triangular Room be an Arc of a Circle of 120° to which the two equal right Lines (BA, CA) are Tangents, including an Angle at A of 60° the other two Angles B and C can be counted nothing.

We receiv'd Anſwers to the Paradox from ſeveral other Hands, but the above being ſufficiently clear, we ſhall proceed to

Anſwer the laſt Years ÆNIGMA's.

I. A WIND-MILL.
II. BUCKLES.
III. FLATTERY.
IV. The TIDES.
V. A SPIDER.
VI. A FABLE.
VII. LOVE.

All the ÆNIGMA's anſwered by Mr. *John Thorpe*.

See *Retford's* WIND-MILL firſt our Thoughts engage 1
Next, *Strephon's* ſparkling BUCKLES gild the Page; 2
Mad Tom thinks FLATT'RY ſeldom fails to pleaſe, 3
Aldrige's Muſe attempts the *Flux* o' th' Seas. 4
In *Bumfield's* Lines a *Spider* we deſcry, 5
And *Lord* moſt neatly has diſguis'd a LYE: 6
Viraketh's myſtic Verſe ſtrives to conceal,
What will (in ſpite of Art) itſelf * reveal: * *Love.* 7
Thus each, on diff'rent Subjects, ſhew their Art;
And each a Pleaſure to the Mind impart.

Again, by the ſame

A WIND-MILL, BUCKLES, FLATTERY, 1, 2, 3,
The TIDE, a SPIDER, and a LYE, 4, 5, 6,
The LOVE-Knots of your Rhymes unty. 7

Mr.

Mr. *William Wiraketh* answers all the ÆNIGMA's in the following Verse inscrib'd to Mr. *M—ll—r* of *B—tt—rt-n* in *Staffordshire*, on his late Marriage.

Felices ter, et amplius,
Quos irrupta tenet copula, nec malis
Divulsus Querimoniis
Suprema citius solvet Amor Die. *Hor.*

Happy the Pair (if Mortals happy be)
Where Mutual LOVE contracts the Unity:
Tun'd to one equal Tone by Sense divine,
Their Souls congenial do in Consort join;
Each Scene of Life with true Content is crown'd,
And TIDES of Pleasure evermore abound:
Of ev'ry Joy, of ev'ry Bliss possess'd,
They, in each other are compleatly bless'd!
Not so with those, where other *Views* combine,
Their *Hands* not *Hearts* in *Wedlock's* TIES * to join;
Who *Fortune* court, make *Wealth* their darling Choice,
Dead to Affection; charm'd with *Interest's* Voice!
Oh strange Delusion! how is Comfort sold!
And Happiness exchang'd for sordid Gold!
What can be hop'd from such a Scene as this,
But cold Indiff'rency a COBWEB Bliss,
Transient as WIND † its sickly Rays scarce glow,
No FABLE can disguise, no Truth can show
The dire Effects of their impending Woe.
FLATT'RY a while may sooth the factious Strife,
Yet does their Mis'ry end not, but with Life:
No Joy, no Bliss, without Affection pure,
For that alone makes *Hymen's* Bands secure.

May the soft Pow'r, my Friend, that you confess
Your Days and Nights with his sweet Influence bless;
May circ'ling Years a pleasing Tribute bring,
And the fair Olive round your Table spring:
Your Undertakings all, Success attend,
And on yourDwelling healthy Dews descend;
And, what will crown and perfect all the rest,
May ev'ry Virtue thrive in either Breast.

7.

4

1

Buckles allud-ed to

3

1. *Allud-ing to the Wind.*
6.

3. *Ma*

In the ſame Manner they were anſwered by Mr. *William Jepſon*, Mr. *Richard Whitehouſe*, Mr. *Edw. Lewton*, *Philotheros*, *True Briton*, *Ens Rationalis*, Mr. *Tho. Atkinſon*, Mr. *Sam. Bamfield*, Mr. *William Chapple*, Mr. *John Hollingworth*, Mr. *Ralph Hulſe*, and ſeveral others.

NEW QUESTIONS *to be anſwered next YEAR.*

(1) Queſt. 31. by Mr. *Abraham Lord.*

TWO Gameſters one Day, at Dice they would play,
And being full merry in Wine;
Says B unto A, what Odds will you lay
I caſt not ſix Faces this Time?
Says A then to B, *ten* to *one* I'll lay thee,
With ſix Dice, ſix Faces you do not;
Pray, Gentlemen, ſhew, and next Year let them know
For the Odds on the Caſt, Sirs, they do not.

(2) Queſt. 32. by Mr. *Robert Robinſon.*

INGENIOUS Gentlemen of Art,
Vouchſafe a *Theorem* to impart;
All the *Dimenſions* to make known,
O'th' lower *Fruſtrum* of a Cone,
The greateſt that inſcrib'd can be
In a Half-Sphere's Concavity;
So that the Fruſtrum may contain
Theſe * Feet which Margin doth explain.

* 4096 *cubic Feet.*

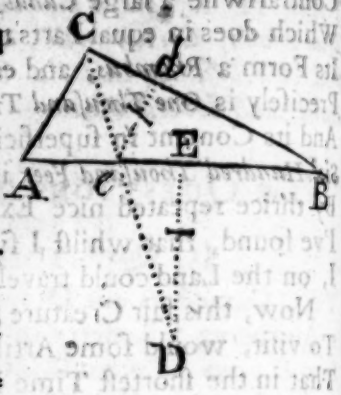
(3) Queſt. 33. by Mr. *John Aſh.*

There is a Circle inſcribed in a Triangle, from the Centre of which ſuppoſe three right Lines, drawn to each Corner; and let the Length of each be given = 40 : 32; and 35 $\frac{1}{2}$; whence 'tis requir'd to find the Radius of the ſaid inſcribed Circle.

(4) Queſt.

(4) Queſt. 34. by Mr. *Tho. Atkinſon.*

A Field o'th' Form i'th' Margin
Each Side I want to find: [plac'd
With *Data's* its but badly grac'd,
But hope that you'll be kind,
And ſhew from what is given [a] here
How I the reſt may know.
The Margin makes the Caſe moſt
To which I leave you now. [clear



[a] *The Perpendicular de* = 103 *Chains; the Angle* ACB = 98° 13′ *biſected with the Line* CD; ED = 23,4 *being a perp. let fall from the Middle of* AB, *upon* C *produced.*

(5) Queſt. 35. by Mr. *John Thompſon.*

Given the Sum of the Sun's Amplitude from the Eaſt or Weſt Points of the Horizon, and Latitude of the Place = 66° 44′ on March 30. *Quære*, the Sun's Amplitude from the North, and Latitude of the Place by a ſimple Equation?

Queſt. 36. by Mr. *John Baulder.*

In any right angled Triangle, the Area (= 294) and the Difference between the Hypotheneuſe and Perpendicular (= 14) being given; to find all the other Parts of the Triangle by a ſimple Equation?

(7) Queſt. 37. by Mr. *Sam. Bamfield.*

FAIR beauteous CHLOE!——all my Soul's Deſire,
Hath kindled in my Breaſt an am'rous Fire;
For ſhe's adorn'd with ſuch pellucid Skin,
The circulating *Blood* may thro' be ſeen;
Her ſpotleſs Features ſhine in each nice Part,
And her *magnetic* Charms attract each Heart:
By all Spectators conſtantly admir'd,
And each the charming Object ſtill deſir'd:
In this fair *Nymph* ſuch Graces do appear,
Her Fame's diſplay'd remote, as well as near;
The Prominence her panting Breaſts advance
Does in each youthful Soul Surpriſe enhance,
This Gem in proper Colours none can paint,
For human Eloquence is all too faint.
In an exact large *geometric* Square
Her Dwelling Houſe and *mine* do both appear;

Each in the Middle of each Side do ſhine,
And her tall Structure's oppoſite to mine;
Contrariwiſe a large *Canal*'s inſcrib'd
Which does in equal Parts the ſame * divide;
Its Form a *Rhombus*, and each Side in Feet
Preciſely is *One Thouſand Twenty-eight*;
And its Content in ſuperficial Ground,
Six Hundred Thouſand Feet is truly found:
By thrice repeated nice Experiments
I've found, that whilſt I ſwam *five Feet, ſix Tenths*
I, on the Land could travel two ſuch Lengths.
Now, this fair Creature I'm reſolv'd each Day,
To viſit, would ſome Artiſt ſhew the way †
That in the ſhorteſt Time I e'er could go
To this fair *Nymph* (white as deſcending Snow)
Hoping to gain her for my lawful Bride,
Who's bleſs'd with *Beauty*, Wit, and *Wealth* beſide.

* i. e. *the two acute angular Points of the Rhombus touches the Middle of the two other Sides.*

† *The Diſtance I muſt ſwim and walk ſeparately.*

(8) Queſt. 38. by Mr. *Joſeph Sowerby*.

Suppoſe an Ellipſis ABCD, to revolve about an Axis touching the Ellipſe in the Extremity of the Tranſverſe, the Diſtance of the Centre of Percuſſion of its greateſt inſcrib'd Parallelogram from the Centre of the Ellipſis is 5 Feet; but, ſuppoſing it to revolve about an Axis, touching it in the Extremity of the Conjugate, the Centre of Percuſſion of the ſaid Parallelogram, is diſtant from the Centre of the Ellipſe 3,3257 Feet, 'tis required to find the Area of the ſaid Parallelogram; with the tranſverſe and conjugate Diameters of the ſaid circumſcrib'd Ellipſis?

(9) Queſt. 39. by Mr. *Edward Verral*.

A Gentleman having a Quantity of old unfaſhionable Silver Plate by him, is deſirous of converting the leaſt part of it poſſible into a Cylindrical Meaſure, that ſhall contain one Ale Quart; the Thickneſs of its Sides and Bottom each to be $\frac{1}{10}$ of an Inch; *Quære* the Dimenſions, and Quantity of Silver, requiſite to make the ſame.

(10) Queſt. 40. by Mr. *Thomas Sandals*.

There is a *Triangular Field*, whoſe Content is known to be = 15 Acres, 2 Roods, and 16 Perches; the *Perimeter* 28 Chains; and one of the Angles 126° 52′ 12″. 'Tis required to find the ſides of the Field ſeparately, by a *general Theorem* that may be of Uſe to the *Practical Surveyor*.

New Ænigma's to be answered next Year.

Une Enigme Françoise à Monsieur *Gamston Retford.*

Si vous ne vous armiez d'une legere armure,
Je pourois vous faire sentir de quisantes douleurs;
Sœur du pinceau, j'assemble les Couleurs,
Et mon ouvrage parfait a la peinture.

(1) Ænig. 19. by Mr. *William Chapple.*

CUSTOM (the *Law* which hath so long prevail'd,
Because it may at Pleasure be repeal'd;
And which, we by *observing* sometimes *break*)
Hath made all Subjects in *Ænigma's* speak.
Hear, whilst you can, the poor Man's Orator,
Which often pleads, but never spoke before.
From *Everlasting* I my Lineage trace,
Prior to *Time*, and unconfin'd to *Place:*
Before the Morning Stars, the Sons of *God,*
Hail'd Infant Nature with a Birth Day Ode,
I, like some indolent majestic Drone,
In sullen Pomp sat nodding on my Throne;
Serene and calm was my unactive Reign
Exempt from War, and all its clam'rous Train.
At length th' extensive Empire I possess'd
Attack'd by pow'rful Enemies decreas'd:
A wild unruly Cur, my mortal Foe,
With open Mouth proclaim'd my Overthrow;
In this Rebellion join'd the brutal Herd,
And all the strifeful Elements concur'd:
And now, the *Poet, Lawyer,* and *Divine*
Against me rise, and all their Force combine;
Inspir'd by *Joy* or *Grief,* or *Fear,* or *Rage*
A motley Host promiscuously engage;
Fierce *Amazons* stand foremost in the Throng;
None so couragious, none hold out so long.
By Numbers thus o'erpower'd I vanquish'd seem,
But soon the Honour of the Day redeem;
All tir'd with fighting, yield at length to *me,*
And to me as their safe *Asylum* flee;
Under my brooding Wings securely sit,
'Till wak'ned by the next rebellious Fit.
When scar'd by clashing Swords and thund'ring Fire,
I from the Field to lonely Groves retire;

There ſooth the fond forſaken Lover's Pain,
Who *ſighs* my Rays, and courts my gentle Reign.
To *me* th' exhauſted Orator ſubmits,
Guarded by me ev'n Blockheads vie with Wits:
In *me*, dull Senators their End obtain,
When Reaſon flags, and Arguments are vain:
Villains in *me*, of Virtue ſeem to boaſt,
Paſt Crimes and Services in *me* are loſt;
By *me* the Fool deceives the Learn'd and Wiſe,
In Deathleſs *me*, all ſhort-liv'd Folly dies.

An *Alphabetical* Catalogue of CONTRIBUTORS to this *Diary*, ſhewing by the numerical Letters i, ii, iii, &c. which Queſt. and by 1, 2, 3, &c. what Ænig. each anſwered.

Academicus, p. 1. *Anaxamander*, all Qu. 2, 3, 4, 5, 7. Mr. *John Aſh* all Qu. and Parad. Mr. *William Aldridge*, vii, viii, , 2, 4, 5, 7. Parad. Mr. *Tho. Atkinſon*, i, ii, vii. all Ænig. n Verſe, Parad. prop. i. and 1. Æ. *Arabella*, all Ænig. but . and 7. Mr. *J. Arden*, iii. Mr. *Geo. Allen*, i. 3. Mr. *William Browne*, vii. all Æn. Calc. ☽ Ecl. Mr. *W. Bevil*, ii. 1, 2, 3, 5. Mr. *Alex. Bo--le*, i, ii, vii. Mr. *Sam. Bamfield*, all Q. all Ænig. in Verſe, Cal. ☽ Ecl. Mr. *John Badder*, all Qu. and all Æn. Miſs *Betty Benniſon*, all Æn. but 5. Miſs *Polly Bright*, all Æn. Mr. *J. Coley*, i, iii, vi. pr. ii. Qu. Mr. *John Caulton*. Par. Mr. *John Canton*, Par. *Tom. Cabbage*, ii. 5, 6, 8, Mr. WILL. COTTAM, all but x. Mr. *Joſeph Colſon*, vii, ix, x. Mr. *John Clarke*, all Qu. and Par. Mr. *Will Chapple*, vii, x. all Æn. in Verſe, pr. 1. Mr. *Miles Dixon*, 2, 7. pr. 1. Mr. *Tho. Dodd*, i, ii. *Vulpes Denelmenſis*, , ii, iii, iv, vii, ix, x. 1, 2, 3, 4, 7. Mr. *Ja. Elgar*, i, ii, iii. Calc. Ecl. *Exonienſis*, ii. Mr. *Rich. Evans*, viii. Mr. *Tho. Fiſher*, i, iii, vii, ix. 3, 5. pr. i. Mr. *Sam. Farrer*, all but v. nd x. prop. iii. Mr. *Tho. French*, vii. Mr. *Tho. Grimes*, i. , vii. 5. *Nic. Gamut* Eſq; all Qu. Cal. ☽ Ecl. Mr. *Rich. ibbons*, all but vi. and ix. Qu. and Par. Mr. *Rich. Hancock*, ii. 1, 2, 4, 5. and Par. Prop. 1. Æn. Mr. *Dan. Howard*, i, , iv, vii. all Æn. but 6. *Hydra*, i, ii, vii, viii. Par. Prop. 3. Mr. *Rob. Hall*, ii, iii, vii, viii, ix. and Par. Mr. *Thomas Hardridge*, Prop. 1. Mr. *Ja. Hemingway*, i. x. 3, 5, 6. Mr. *J. Hollingworth*, all Æn. in Verſe, and Par. Prop. 1. Mr. *Ralph Hulſe*, and all Ænig. in Verſe, Prop. 3. and Epig. Calc. Epacts nd Ecl. Mr. *Geo. Ingman*, all Q. and all Ænig. Mr. *Will.*

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